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CIVIL ENGINEERING.

*Norris's Railway Joint Chair.**

The following paper on Mr. Norris's new joint chair was read at the last meeting of the Institution of Mechanical Engineers at Birmingham:

In bringing before the Institution a plan for a new kind of joint chair for railways, it will be unnecessary to expatiate on the advantages of a *firm joint*, as regards economy of maintenance of the road and rolling stock, and safety.

The object of this paper is to describe a method which has been in use on a crowded part of the London and North-Western Railway for above eighteen months, during which time it has stood well, and is now being extensively used on the same line.

The plan is to cast a chair or coupling on the rails at the joints as they lie in the line, by means of chills and a portable cupola. The hot metal flowing freely into the chill is allowed to come in close contact with the rails, and in cooling contracts so as to grip the ends of the rails firmly together. The great object to be attained is the converting of the rail into a continuous girder, which shall not deflect at the joint more than at any other part; every successive year's experience having forced the attention of engineers and others to this point, to attain which many plans have been tried with more or less success.

Whatever mode of joint is adopted, or whatever method of jointing the ends of rails, it is necessary that a certain allowance should be made for the longitudinal motion caused by the expansion and contraction of the rail. This object is attained, wherever necessary, by putting the chills, previously heated, on the ends of the rails for a short time, until they become hot, when they are taken off, and a thin wash of loam and

* From the London Mechanic's Magazine, October, 1853.

blacking is laid upon the rail end, which instantly dries on, and when the melted iron is poured against it, absolute contact with the rail is prevented. Although provision is thus made for the expansive and contractile force of the rail, the cavity in the chair being parallel to the rail, clips it sufficiently tight to prevent any vertical or lateral motion of the rails; the amount of surface of contact between the rail and chair is about 100 square inches, being 50 square inches to each rail end.

This great surface prevents any perceptible wear taking place on the rail-ends from the longitudinal motion of expansion; and as no motion can take place vertically or laterally, no shock can take place by the action of the wheels, so that the joint will remain good for years, which has been confirmed by practice, so far as it has gone.

The operation of casting is very simple, and is performed without hindering the pacing of trains during the execution of the work.

The apparatus consists of chills and a portable cupola, and the process is as follows, when operating on a line already laid:—Each joint-sleeper or block is first lowered by the plate-layers about three inches, so as to give room for the application of the chills, or is removed altogether for the time, and the old chair being taken off the joint, the chills are applied, consisting of a bed plate with two lips, one on each side, holding down the side-chills, which slide in the grooves; these are put to the rail and held together by screw-clips, forming a mould for casting the chair. This operation is quickly performed, and the chill is then packed under temporarily with loose metal plates; the moment this is done a train may pass over it without hindrance.

Two steel pins are then put in their places in the chills, so as to form the cores for the holes of the holding-down spikes. The chill mould being thus fastened in its place, is ready for the melted metal, which is run into it at the lip, until it is level with the top of the sides, where a large open space is left for the escape of air, which prevents all possibility of blowing.

The chills are made to fit the rails by projections at each end, which grip the rail firmly, and a little loam is applied on the outside, to prevent the hot metal making its way out of the chill-mould.

After a lapse of about five minutes the mould is taken off, which is done in an instant, leaving the chair perfect, and closely embracing the contiguous ends of the rail. The form of this chair is such as to make it a strong and rigid clip, closely fitting the two ends of the rail along its whole length. Chairs may by this method be cast of any form. When the chair is cold enough, the sleeper or block is replaced, and the chair spiked to it.

The operation is the same in relaying new roads, only that the expense of lowering or removing the block or sleeper is saved.

The metal used up to the present time has consisted of old chairs, mixed with a little new iron. This is melted in a portable cupola, formed of a cylinder of sheet-iron $\frac{1}{8}$th of an inch thick, 2 feet 3 inches in diameter, and 4 feet 6 inches high, lined with fire bricks and clay in the usual manner, 4 inches thick.

The cupola weighs about 6 cwt., and is easily lifted by the workmen on to a plate-layer's lorry, and taken to the place required, when it is

lifted off, and placed on a few sleepers laid on the slope of a cutting or embankment. When once so placed it will serve for half a mile of road without moving again, as the metal is so hot as to enable its being taken, in a moulder's ladle, on a lorry, to the chills at a quarter of a mile on each side the cupola.

The cupola has a belt or air chamber, into which passes the air from the fan, and it has four tuyeres of two inches' orifice to admit the air to the fire. The fan consists of a chamber 1 foot 10 inches inside diameter and 9 inches wide, and weighs about 3 cwt.; it is detached from the cupola by drawing out the nozzle from the entrance to the air belt, and can then be lifted separately into its place. The fan is either turned by hand-winches, or, when the operations are extensive, by a small steam-engine, weighing about 10 cwt., and can be lifted by eight men, and placed on and off a lorry, and on the slope, in the same manner as the cupola.

The yield of metal from so small a cupola is very great: as much as 3½ tons has been run down in seven hours, by two men turning the handles of the fan, and nearly 4½ tons by the use of the engine in the same time.

A smaller cupola, weighing about 2 cwt., is used for repairs of the line.

A good fastening is made for middle chairs by taking out the wooden key from the common middle chair, and casting an iron one in its place. This is done by heaping dry sand around the chair, as it stands in its place, and then running metal into the cavity so formed, leaving a lip projecting over the chair. Only a few of these have yet been put down; but they have stood the test of two years' working over without failure, and are still tight. In casting, the hot metal running into the chair expands it, and its contracting upon the cast key in cooling makes it tight.

It may be remarked, that the new chair occupies exactly the same position on the sleepers, and has the same fixing, as the common joint-chair; so that in case of damage to the line from accident or slips, it can be repaired quickly in the ordinary manner, by using the old chairs and wood keys until the small cupola can be brought to bear.

Mr. Norris exhibited specimens of the chairs and the cast iron mould, complete; also a specimen of one of the new joint-chairs from the North Union Railway, which had been laid down for eighteen months in a line of great traffic, where 500,000 wheels had passed over it during the time; the two rail ends were cut off, and remained fixed fast in the chair, and the surface of the joint was level and smooth, although the rail ends had been much indented at the time the chair was cast on, from the rails having been recently turned.

The Chairman inquired what length of line had been tried with the new chairs, and how long they had been at work?

Mr. Norris replied, that five miles had been recently laid with these chairs near Rugby, and about a mile was previously laid near Crewe, and elsewhere, which had mostly been at work one and a half years.

Mr. Woodhouse said, the recent trial of the chairs near Rugby had been made under his superintendence, and he had found the result highly satisfactory. It had been intended to relay that portion of the line during the present summer; but the new joint-chairs had proved of such benefit,

that they would probably give several years additional life to that road. He consequently recommended the adoption of the plan on a considerable length at other parts of the line, which was now in progress.

The Chairman asked what difference was felt in the trains running over the joints on the portion that had been altered at Rugby?

Mr. Woodhouse said, the joints could not be felt at all with the new chairs; there was no comparison of the ease in traveling over the old plan of joints.

The Chairman asked what was the usual time required for the process of casting the chairs?

Mr. Woodhouse replied, that the average of the work done at Rugby was about one chair cast every four minutes, including the whole process of preparation.

Mr. Slate remarked, it was certainly a very ingenious process of casting the chairs, and must make a thoroughly firm joint; he inquired what was the expense of casting?

Mr. Norris said that the labor of casting cost about 6d. per chair, and the cost was about 1s. per chair, including all expenses except the metal, which weighed about 50 lbs. The expense of casting was much diminished as the men got more experienced in managing it. At first they could only cast 40 chairs per day, but the rapidity of casting increased with practice to 80 per day; and now 120 per day were cast by common plate-layers, who had never before had anything to do with melted iron.

Mr. Slate said he had seen the first of these chairs one and a half years since, and had then an unfavorable opinion of their standing in work from the great contraction of the melted metal in cooling on the rigid rail; but it appeared that the wrought iron rail was expanded by the heat of the melted metal sufficiently to make the chair safe by its contraction again in cooling. He thought the new chair made a very perfect coupling of the rail ends, and was a great improvement on fishings and other plans, which he could only regard as makeshifts; and though they had a very good effect compared with the previous plan of having nothing to couple the rails together at the joints, they were still far removed from perfection. The new chair might be said to be quite perfect, if it could be made quite fast on the rail without allowing it to slide.

Mr. Norris observed, that only every third or fourth joint was made a slip joint for expansion; he was aware what a great advantage it would be to have no slip-joints, and by no means maintained that to be impracticable; the expansion of the rails successively by the heat of casting the chairs on, would perhaps elongate them sufficiently to make provision for the expansion from the highest temperature they would be afterwards exposed to, and the tension would then resist the contraction from cold.

Mr. May remarked, that Mr. Brunel had now many miles' length of Barlow's rail on the South Wales Railway, all riveted fast together, without any provision for expansion, and no difficulty was experienced in consequence. There was some misconception on this point, respecting the action of expansion; it was limited in amount of force, and if opposed by a greater force, no amount of expansion or contraction could take place. Wrought iron raised in temperature 15° was expanded $\frac{1}{10000}$th

of its length, and exerted a force of 1 ton per square inch of section by the expansion; consequently, no expansion of the rails would take place if a resistance were opposed of 1 ton per square inch for each 15° rise of temperature. He thought it probable that Mr. Norris's plan ultimately would require to have no expansion joints to perfect it, and in many cases he did not doubt the plan being an excellent one.

Mr. James Nasmyth said he had witnessed the whole process of casting the chairs, and fitting on the iron moulds, and considered it a very successful plan, and of the utmost value and importance to the durability of the line as well as to the safety of the public. The trains ran full speed over the red hot chairs directly after they were cast. He thought the slight tortuosities of all roads, even in the straight parts, would be probably found sufficient to allow for the effect of expansion, without making any provision of slip joints.

Mr. May suggested, that an experiment could readily be tried to ascertain the actual amount of expansion of the rails, by having a number of thin graduated wedges, to be dropped into the joints at the hottest part of the day and at night, to measure the amount of expansion over a considerable length of rail. It would probably be found to be very insignificant, as the ordinary chairs offer a considerable resistance to a longitudinal motion of the rail, by the hold of the keys on the rail, the chairs on the keys, and the ground on the sleepers; though of course the resistance in Barlow's rail was a different case, where the rail, chair, and sleeper were all one.

Mr. Woodhouse remarked, that in laying the rails the men place small wooden or iron packing pieces, $\frac{1}{16}$th of an inch thick, between the rail ends at the joints, to make the ordinary allowance for expansion; and they always find that if these pieces are put in early in the day, they become so tight in the middle of the day that they cannot be got out, but are quite loose in the cool of the evening.

The Chairman observed, there was no doubt the expansive action of the heat would always produce its full effect, either by compressing the iron of the rails, or producing some motion or distortion in their position.

Mr. Norris said, that cases had occurred of the road becoming hog-backed, rising with the sleepers out of the ballast, from the want of sufficient allowance for expansion; also in curves, the rails and sleepers had been pushed bodily outwards in the ballast by the effect of expansion. The extreme change of length in this country, from 80° or 90° variations of temperature, amounted to a yard per mile, and this yard length must be disposed of somewhere in each mile, either by sliding or tension, or else by bending upwards or laterally, if there was not less resistance to compression of the iron.

Mr. C. Cowper remarked, that the extreme change of temperature of 90° would cause a total strain on the iron of 6 tons per square inch, at 1 ton for 15°, which amounted to the very severe total force of 40 or 50 tons on the whole sectional area of the rail of 7 or 8 square inches, to overcome any supposed resistance.

Mr. May thought the change of temperature in the rails would be considerably less than that of the air, because they were partly buried in the

ground, and must therefore follow the temperature of the surface of the earth, which fluctuated much less than that of the air.

Mr. Duclos remarked, that the expansion or contraction of the rails would only take place from the mean temperature to the maximum or minimum; and as the mean temperature of the air in this country was about 50°, and the maximum 90°, making a change in the air of 40°, the actual change in the rails from the mean temperature was probably less than 30°, causing a strain of not more than 2 tons per inch expansion or contraction.

The Chairman observed, it was an important subject for consideration, whether the allowance for expansion could be entirely dispensed with; and the new chair appeared an important step in that direction, and might lead to doing away with longitudinal bearings.

Mr. Norris said that his attention had been first directed to the subject of this chair about two years since, by the circumstance of a very extensive alteration having been in contemplation from the ordinary rail and cross sleepers to a bridge rail on longitudinal timbers, the alteration being proposed entirely on the ground of obtaining a superior coupling of the joints with the longitudinal bearing than the ordinary rail and chair. But he objected to the bridge rail and longitudinal timbers as more expensive; and the idea then occurred to him of running the melted metal into the chairs to fill them up solid, and make a rigid coupling of the joint; and this led him to casting the joint-chairs solid upon the rails in their places, as the complete way of carrying out the object.

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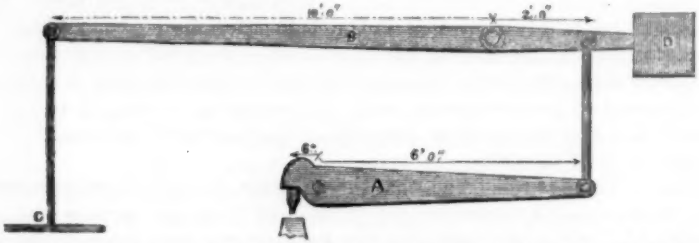
*Table of Pressures necessary for Punching Plate Iron of various thicknesses.**

The following table exhibits the results of a series of experiments made some time ago at the Great Western Steam Ship Works, Bristol, for the purpose of determining the actual pressure necessary for perforating wrought iron plates of various strengths. The trials were conducted in the most careful manner by Mr. John Jones, the inventor of the Cambrian engine, the lever punching press delineated in the annexed diagram being used for the purpose.



The first lever, A, is 6 feet 6 inches long, with its fulcrum 6 inches from one end, so that its leverage is as 12 to 1. The second lever, B, is 12 feet long, with one arm of 2 feet, making 5 to 1. Hence the gain in leverage = $12 \times 5 = 60$ times; so that 1 cwt. on the scale is equal to 3 tons on the punch. The punching weights are hung on the scale, at C, and at D is a back balance.

* From the London Practical Mechanic's Journal, November, 1853.

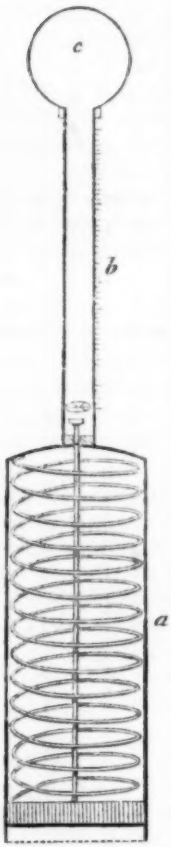
Diam. of Pun.	Thick. of Plate.	Weight in the Scale.			Pressure on the Punch.			
In.	Wire Gua.	Cwt.	qrs.	lbs.	Ton.	Cwt.	qrs.	lbs
1/4	16	0	1	17 1/2	1	4	1	14
1/4	16	0	1	16 1/2	1	3	3	10
1/4	15	0	2	2 1/2	1	11	0	23
1/4	15	0	2	1	1	10	1	4
1/4	15	0	1	26 1/2	1	9	1	9
1/4	14	0	2	12	1	16	1	16
1/4	14	0	2	8	1	14	1	4
1/4	14	0	2	13 1/4	1	17	1	5
1/4	13	0	3	5 1/2	2	7	3	12
1/4	13	0	3	6	2	8	0	14
1/4	13	0	2	16	1	18	2	8
1/4	13	0	2	14	1	17	2	0
1/4	12	0	2	21 1/2	2	1	2	2
1/4	12	0	2	19	2	0	0	20
1/4	12	0	2	20 1/2	2	0	3	26
1/4	11	0	2	23	2	2	1	8
1/4	11	0	2	25	2	3	1	16
1/4	11	0	2	24 3/4	2	3	1	1
1/4	10	0	2	27	2	4	1	24
1/4	10	0	3	0	2	5	0	0
1/4	10	0	2	25 1/2	2	3	2	18
1/4	9	0	3	8	2	9	1	4
1/4	9	0	3	7	2	8	3	0
1/4	9	0	3	8 1/4	2	9	1	19
1/4	8	0	3	26	2	16	1	20
1/4	8	0	3	25	2	18	1	16
1/4	8	0	3	23	2	17	1	8
1/4	8	0	3	24	2	17	3	12
1/4	7	1	0	1 1/4	3	0	2	19
1/4	7	1	0	1 1/4	3	0	2	19
1/4	7	1	0	2 1/4	3	0	4	23
1/4	6	1	0	11	3	5	3	16
1/4	6	1	0	14	3	7	2	0
1/4	5	1	0	26 1/2	3	11	2	22
1/4	5	1	1	4 1/4	3	17	1	3
1/4	5	1	1	2 3/4	3	16	1	25
1/4	4	1	1	1	3	15	2	4*
1/4	Inch							
1/4	1/8	1	0	18 1/4	2	9	3	3
1/4	1/8	1	0	15	3	8	0	4
1/4	1/8	1	0	13	3	6	3	24
1/4	1/8	1	0	11 1/2	3	6	0	18
1/4	3-16	1	1	24	4	7	3	12
1/4	3-16	1	2	2	4	11	0	8
1/4	3-16	1	1	18	4	4	2	16
1/4	1/4	1	3	26	5	18	3	20
1/4	1/4	2	0	8 1/2	6	4	2	6
1/4	1/4	2	0	0	6	0	0	0
1/4	5-16	2	0	3	6	1	2	12
1/4	5-16	2	0	15	6	8	0	4
1/4	5-16	2	0	14	6	7	2	0
1/4	3/8	2	2	21 3/4	7	1	2	17
1/4	3/8	2	2	15	7	18	0	4
1/4	3/8	2	2	15	7	18	0	4
1/4	7 16	2	3	11	8	10	3	16
1/4	7-16	2	3	8	8	9	1	4
1/4	7-16	2	3	5	8	7	2	20
1/4	1/2	3	1	1 1/4	9	15	2	9*
3/8	1/4	2	2	15 1/4	7	18	0	19
3/8	1/4	2	2	17	7	19	0	12
3/8	1/4	2	2	19	8	0	0	20
3/8	5-16	3	0	0	9	0	0	0
3/8	5-16	3	0	8	9	4	1	4
3/8	5-16	3	0	10	9	5	1	12
3/8	3/8	4	0	5	12	2	2	20
3/8	3/8	4	0	0	12	0	0	0
3/8	3/8	4	0	14	12	7	2	0
3/8	7-16	4	2	5	13	12	2	20*
1/2	1/4	1	3	27	5	16	3	4
1/2	1/4	1	3	26 1/2	5	19	0	22
1/2	1/4	1	3	23	5	17	1	8
1/2	3-16	2	2	16 1/2	7	18	3	10
1/2	3-16	2	2	18 1/4	7	19	3	3
1/2	3-16	2	2	12	7	16	1	20
1/2	1/4	3	2	21	11	1	1	0
1/2	1/4	3	2	11	10	15	3	16
1/2	1/4	3	2	10	11	0	2	24
1/2	5-16	4	0	18	12	9	2	16
1/2	5-16	4	0	20	12	10	2	24

Diam. of Pun.	Thick. of Plate.	Weight in the Scale.			Pressure on the Punch.			
in.	Inch.	Cwt.	qrs.	lbs.	Ton.	cwt.	qrs.	lbs
1/2	5-16	4	0	18	12	9	2	16
1/2	3/8	5	2	3	16	11	2	12
1/2	3/8	5	2	5	16	12	2	20
1/2	3/8	5	2	5	16	12	2	20
1/2	7-16	6	2	14	19	17	2	0
1/2	7-16	6	2	11	19	15	3	16
1/2	7-16	6	2	26	20	3	3	20
1/2	1/2	7	0	7	21	3	3	0
1/2	1/2	7	0	0	21	0	0	0
1/2	1/2	7	3	14	23	12	2	0
1/2	9/16	8	3	16	26	13	2	8†
1/2	9/16	8	3	21	26	16	1	0
1/2	11-16	8	3	7	26	8	3	0
1/2	11-16	8	3	18 1/4	26	14	3	3
1/2	11-16	8	3	14	26	11	3	24
1/2	3/4	10	1	19 1/4	31	5	1	7‡
5/8	1/4	4	1	1	12	15	2	4
5/8	1/4	4	1	15 1/4	13	3	0	19
5/8	1/4	4	1	7	12	18	3	0
5/8	9/16	7	0	7	21	3	3	0
5/8	9/16	7	0	14	21	7	2	0
5/8	1/2	7	1	0	21	15	0	0
5/8	1/2	8	3	14	26	12	2	0
5/8	1/2	8	3	7	26	8	3	0
5/8	1/2	8	3	8	26	9	1	4
5/8	5/8	11	1	11	34	0	3	16
5/8	5/8	11	0	0	33	0	0	0
5/8	5/8	10	3	21	32	16	1	0
5/8	3/4	12	0	0	36	0	0	0*
3/4	1/4	5	1	0	15	15	0	0
3/4	1/4	5	0	18	15	9	2	16
3/4	1/4	5	0	18	15	9	2	16
3/4	9/16	7	3	0	23	5	0	0
3/4	9/16	7	1	21	22	6	1	0
3/4	9/16	7	1	14	22	2	2	0
3/4	5/8	9	1	14	28	2	2	0
3/4	5/8	9	1	11	28	0	3	16
3/4	5/8	9	1	17	28	4	0	12
3/4	5/8	11	1	24	34	7	3	12
3/4	5/8	11	1	0	33	15	0	0
3/4	5/8	11	2	10	34	15	1	12
3/4	3/4	14	3	7	44	8	3	0‖
7/8	1/4	5	3	11 1/2	17	11	0	18
7/8	1/4	6	0	11 1/2	18	6	0	18
7/8	1/4	6	0	0	18	3	0	24
7/8	5/8	9	0	24	27	12	3	12
7/8	5/8	9	1	11	28	0	3	16
7/8	5/8	9	1	10	28	0	1	12
7/8	1/2	12	3	21	38	16	1	0
7/8	1/2	12	2	8	37	14	1	4
7/8	1/2	12	1	0	36	15	0	0
7/8	9/16	14	3	0	45	5	0	0
7/8	9/16	14	3	0	45	5	0	0
7/8	9/16	14	3	6	45	8	0	24
7/8	5/8	18	2	11	55	15	3	16
7/8	5/8	18	2	0	55	10	0	0
7/8	3/4	18	1	14	55	2	2	0
7/8	3/4	18	2	0	55	10	0	0§
7/8	7/8	18	0	0	54	0	0	0§
7/8	1	22	0	0	66	0	0	0¶
1	1/4	7	1	0	21	15	0	0
1	1/4	7	1	5	21	17	2	20
1	1/4	7	0	0	21	0	0	0
1	5/8	11	0	5	33	2	2	20
1	5/8	11	0	0	33	0	0	0
1	3/4	10	3	0	32	5	0	0
1	1/2	12	3	22	38	16	3	4
1	1/2	13	2	14	40	17	2	0
1	1/2	14	0	18	42	9	2	16
1	5/8	15	3	21	47	16	1	0
1	5/8	16	1	16	49	3	2	8
1	5/8	16	0	0	48	0	0	0
1	3/4	20	1	14	61	2	2	0
1	3/4	20	1	8	60	19	1	4
1	3/4	20	0	7	60	3	3	0
1	1	25	2	25	77	3	1	16¶

* Punch broke. † Die and punch broke. ‡ Die broke. § Punch bent and die broke. ‖ A piece of 7/8 bar iron, very soft, and too narrow for a true punch. ¶ Machine would not allow of a stronger piece being punched.

On an Instrument for taking Soundings. By F. Maxwell Lyte, Esq.*

Gentlemen—As I see, from what Dr. Scoresby has been saying before the Association at Hull, there seems to be some difficulty about obtaining a correct sounding in places where the currents are strong and flow in different directions at the different points of depth, causing the line to assume different curves in its descent; and when it comes to be measured over, after the weight has reached the bottom and been hauled up again, the measurement gives no approximate idea of the real depth,—now it is plain that this mensuration of the depth of water might be as well made by estimating its vertical pressure, as, in measuring the height of mountains, we measure the barometrical pressure of the air; and so I would propose to do it by an instrument constructed as follows:—



An accurately constructed tube of gun-metal or brass, or some metal not very easily corrodible by salt water, has a glass tube fitted on to it on the top by a screw joint, and again on the top of the glass tube is fitted a strong hollow copper ball by a similar screw joint. The lower tube, which we will call *a*, has a well turned piston fitted to it, from which runs a rod which is only a trifle longer than the tube *a*, and just enters the tube *b* when the piston is at its lowest point. A well made spring is placed in the tube *a* above the piston, and the tube *a* being narrowed at the top, so as just to admit the free passage of the rod, and the rod having a little button at its top, the piston is kept at its lowest point by the spring, except when sufficient pressure is applied from below to compress the spring. The glass tube has a small ring fixed in it, just so as to stick at any point to which it is pushed, and the button at the top of the rod serves to push the ring straight, and the ring thus forms an index of the degree to which the spring has been compressed. The ball on the top serves as a mere reservoir of air to equalize the action of the apparatus as much as possible. The whole of this apparatus is enclosed in a wire cage for the sake of protection from blows. To graduate this apparatus, I let it down in a known depth of water, say ten fathoms, and having observed the point to which the ring in the glass tube is pushed, and having marked this point off, the ball is to be unscrewed, and with a small ramrod the ring is to be pushed down till it rests on the top of the piston rod. The ball being replaced, the apparatus is sunk in twenty fathoms; after a similar manner it is sunk in thirty, and next in forty fathoms. This will test the accuracy of the apparatus; and the marks made on the glass tube *b* after each trial will give a scale from which the whole tube may be graduated, even to thousands of fathoms, if the tube be long

* From the London, Edinburgh, and Dublin Philos. Magazine, November 1853.

enough or the spring strong enough. I have been induced to make this communication on account of the great use which may be made of such an apparatus.

Florian, Torquay, September 19.

Communication of the Board of Directors of the Panama Railroad Company to the Stockholders, together with the Report of the Chief Engineer to the Directors.

Communication of the Board of Directors.—Geo. M. Totten, Esq., the Chief Engineer of the Panama Railroad Company, has just submitted to the Board of Directors his annual report of the condition and prospects of this important work.

In presenting his report to the Stockholders of the Company, the Board deem it fitting that it should be accompanied by a brief statement of their views of the enterprise in which they are engaged.

Confident as they have ever been of the final accomplishment of the work, and at one period entertaining the hope of its completion during the present year, they have never realized so strongly as they now do, the certainty of the early consummation of their plans.

When the enterprise was commenced, the undertaking was as novel as it was formidable, and your Board enjoyed no advantage from the experience of others, no work of the kind having ever been performed under similar circumstances.

In a foreign country, where no road for wheel vehicles had ever existed, and possessing no supplies either of food or materials, it became necessary to send every thing from the United States, even laborers themselves to a great extent. Yet under these disadvantages, the road was so far finished in seventeen months, for a distance of twenty-three miles, as to admit of the passage of the cars, and over this portion of it daily trains have been run from that time to this.

At this point in the history of the road, your Board changed their mode of operations, and entered into an arrangement with other parties for the prosecution of the work, under the expectation that it would be pushed forward more vigorously, and be completed earlier, than by adhering to their previous plan.

They were disappointed in this expectation, and after the lapse of about fourteen months, during which time only eight miles more of the road were graded, in addition to the labor performed on the bridge crossing the Chagres River, they again took the work into their own hands, and are now carrying it on in the same general manner which was adopted at first, but with greater advantage, derived from their former experience, and from the increased facilities of obtaining native and other labor, and having the use of that portion of the road now in operation, for the conveyance of materials and men.

In view of the past history and present condition of their operations, in connexion with the character of the country over which the remaining eighteen miles of the road are to be constructed, and relying, as they do,

on the ability and intelligence of their Chief Engineer, the Board feel no hesitation in expressing to the Stockholders, their firm conviction that the work will be so far completed in all of the ensuing year, as to admit of the regular passage of the cars from ocean to ocean, and they entertain the hope that the time will not be prolonged beyond the month of August.

The Chief Engineer, in making his report, prepared some estimates of the income which may be anticipated from the business of the road on its completion, but inasmuch as they might be deemed extravagant by those not so familiar with the subject as himself, the Board have thought it best to omit them. Some idea may be formed, however, of the probable results, when it is considered how large the earnings have been on the section of the road now in operation, and how large a proportion of the expense of transporting passengers and merchandize across the Isthmus, is now received by the muleteers,* whose business will pass to the road, at once, when finished.

It should also be borne in mind, that the running expenses on a line like this, must necessarily bear a much less proportion to the receipts, than on any other road in the world.

That the business of the road will not remain stationary, but be greatly enlarged, admits of no question, and it will not be surprising should the views of the most sanguine in this respect be realized. A material increase may be looked for, on the opening of the line to the Obispo, at the close of the present year.

Already has the attention of capitalists in Great Britain and on the continent of Europe, been awakened to the importance of this route as a means of communication with the west coast of South America, the Sandwich Islands, China, Australia, and California. In addition to the Royal Mail Steamship line, now running between Southampton and Aspinwall, by way of the West Indies, three other lines have been organized to ply between Aspinwall and England. Besides, a French Company are engaged in building several steamers, under the auspices of the Government, to run to Aspinwall, and connect with other lines from Panama to Australia.

Add to these, the two American lines of first class steamers from New York, and one from New Orleans, and we have eight lines which will connect with the Atlantic terminus of our road when completed.

On the Pacific side, at least five lines will soon radiate from Panama, and probably others, with passengers and merchandise for California, Valparaiso, Australia, &c.

The Board might greatly enlarge, but it is not necessary. They entertain no apprehension of any want of employment for your road. On the

* The Railroad now receives less than one cent per pound for ordinary freight, and two cents per pound for express freight and extra luggage carried over the twenty-three miles, from Aspinwall to Barbacoas, while seventeen cents per pound are paid the muleteers from the latter point to Panama. On the opening of the road to the Obispo—eight miles further—the rates charged by the road will be considerably enhanced.

The rates for through freight, when the road shall be completed, has not been fixed, but the proportion will be materially increased, while the expense to shippers will be greatly diminished.

contrary, they are persuaded that, with a single track, its utmost capacity will be tested by the business which will be offered.

Should any of the Stockholders deem them visionary in their views, or too sanguine in their expectations, the Board beg leave to remind them that most of their number have been identified with the enterprise from the beginning, through good report and evil report, and have thus had superior opportunities for forming correct opinions; and although they would not conceal from themselves the fact that difficulties are yet to be encountered, they are willing to hazard their reputation as men of judgment on the success or failure of the enterprise they have undertaken.

The Board think the following information in relation to the real estate of the Company will be interesting to the Stockholders, most of whom, it is presumed, are not acquainted with the facts.

Under the original grant from the Government of New Grenada, for the exclusive privilege of constructing a railroad across the Isthmus of Panama, they ceded to the grantees about 300,000 acres of land, to be located along the line of the road, or at other points within the territory of the Government, as the grantees might select, together with the right to all the mineral wealth which the same might contain. In transferring their rights and privileges to the Panama Railroad Company, the grantors ceded to the Company one-half of the lands thus obtained.

By a subsequent arrangement with the Government, the Island of Manzanilla (Navy Bay) was received in exchange for a portion of the wild lands previously ceded, two acres of the latter being given for one of the former. The Island of Manzanilla, on which the city of Aspinwall is situated, comprises an area of about 650 acres.

The Island has been surveyed, and a portion of it laid off into blocks and lots, and prepared for the erection of buildings; of which over 300, of substantial character, have already been put up, by parties who have leased the ground, and which yield an annual income of about $15,000. A largely increased income from this source is anticipated at no distant day.

In addition to this, the Company possess one-half interest in three Islands in the Bay of Panama, which, it is believed, will ultimately be of great value.

They have also secured by purchase, at Panama, and grant from the Government, all the ground which may be required for depots, work-shops, &c., together with the right to reclaim and hold in perpetuity so much of the lands and flats lying below high water mark, as may be found necessary or desirable for their purposes.

It is difficult to estimate the importance of these possessions to the interests of the Company; in the judgment of many well informed parties, they will prove equal to the entire cost of the road.

The Board take much pleasure in stating that the Government of New Grenada, with a just appreciation of the importance of the undertaking, not only as bearing on the prosperity of their own country, but in its relations to the commerce of the world, have manifested every disposition to second the Board in their efforts to promote the objects they have in view; and in closing this communication, they would do injustice to

their feelings, were they not to express their grateful sense of the spirit of liberality and the courteous deportment, which have characterized the Government in all their intercourse with the officers of the Company.

William H. Aspinwall,	Cornelius W. Lawrence,
Henry Chauncey,	Edwin Bartlett,
G. B. Lamar,	Henry A. Coit,
Edward J. Woolsey,	George Law,
Joseph B. Varnum,	William C. Young,

David Hoadley.

The signatures of Gouverneur Kemble and Thomas W. Ludlow are omitted, in consequence of their absence in Europe.

New York, Nov., 1853.

Report of the Chief Engineer.—The period of the year having arrived when it is usual to prepare for the operations of the approaching dry season, I beg leave to present to your Board the following Report upon the condition and prospects of your road:

The whole length of the road from ocean to ocean, as finally located, is 49 miles, of which distance the portion from Aspinwall, the Atlantic terminus, to Barbacoas, where the line crosses the Chagres River, 23¼ miles, has been in operation the past sixteen months (since July, 1852).

Nine miles of this division were originally laid on piles and cribbing, which were the means adopted for crossing the low grounds and swamps, through which this part of the line passed; all of which, with the exception of about 1000 feet, is now filled in with earth. This track at present lies on firm embankments.

During the past year many of the original trestle structures for crossing the streams have been replaced by substantial culverts, or bridges, with masonry abutments, and iron superstructures, which style of work is being adopted throughout the whole line as rapidly as circumstances will admit.

During the past year, also, many portions of the track have been ballasted, and a large number of the original spruce and native soft wood cross ties, have been replaced with others, of lignum-vitæ, and other hard and durable woods, which will be continued throughout the whole road.

These improvements being completed, as they shortly will be, and your iron, which is of the bridge pattern, being of very superior quality, weighing 60 lbs. to the yard, it cannot fail to be seen that you will soon have as perfect a road as can be found in the United States, as it is already of fair average character.

The erection of the bridge over the Chagres River has been impeded by various causes, among which may be mentioned, an untimely flood in April last, which carried away the main span, when nearly completed. This span is now securely placed, and the whole bridge will probably be completed by Dec. 1st. The substantial stone piers and abutments are already finished.

From Chagres River to Obispo, 7⅞ miles, the grading is nearly finished, and three miles of track are laid.

By Dec. 1st, or as soon as the bridge is completed, the road will be open for the trains to Gorgona, 5½ miles from Barbacoas, the present terminus; and by Jan. 1st, to the Obispo, 7⅞ miles, or in all, 31 miles from Aspinwall, the Atlantic terminus.

Within the past few months the mule road from Cruces to Panama has been under repair, and it is now in a very passable condition. It is still in the course of improvement by a force of 150 laborers, which will be maintained upon it during the present wet season.

A branch road is under construction from the line of the railroad, near the Obispo, to the Cruces road, by which means, when the trains reach this point, the passengers and freight will be transferred directly from the cars to the mules; the river route, which is now so tedious and disagreeable, will be avoided; and the transit will be readily made from ocean to ocean, in twelve hours.

Noting now, that the grading of the remaining portion of the road is commenced along the Obispo, as well as at Panama, the Pacific terminus, and that eight miles of this distance is already cleared of the timber, and prepared for working operations, we have the true state of the work at the present time.

Recapitulating, then, the substance of the foregoing, it appears, that out of the 49 miles, which will be the whole length of the road from ocean to ocean, 23¼ miles are already in operation, and in good condition, and that by the 1st of January, 1854, 7⅞ miles more, making 31 miles, will be in operation, leaving 18 miles to be constructed, and that these 18 miles are already commenced at both ends, upon which large forces are fast accumulating.

I now come to the plan of operations for the future, or rather, for the approaching dry season, and the prospect before us, the scene of which will be the division of 18 miles above mentioned, extending from the lower crossing of the river Obispo (the line crosses this river twice in the space of one mile) to the Pacific terminus of the road at Panama, upon which division, as I have just stated, the work is already commenced, both along the valley of the Obispo, and at Panama.

In this distance we cross the summit ridge, the maximum grade on the Atlantic slope being 61 feet per mile, and on the Pacific slope, 70 feet per mile, and the total rise 250 feet above high tide of the Pacific.

In any other country, the ground over which this line passes would be considered favorable. The heaviest work is at the summit, where a cutting is encountered 1300 feet in length, and 24 feet in greatest depth, containing 30,000 yards of favorable excavation.

The time requisite for constructing this division must, of course, depend upon the amount of labor which can be thrown upon it.

Supposing that the work is of the same average character as the eight miles below, constructed by Mr. Story, which it is, both in regard to the amount of work, or number of yards per mile, and character of soil, and taking the fact that these eight miles were graded in about ten months, with an average force not exceeding 900 men, the 18 miles now to be

constructed can be graded in six months, with a force of say 3370 men.

Temporary bridge and track will require	300
Masons and Quarrymen, . .	200
Repairs and completion of road, below Barbacoas,	500
" " " " above "	200
Total force required, .	4570

say 5000 men to complete the road in six months.

It would, perhaps, be thought more appropriate by some persons, to estimate the number of men required to do this work, by the number of yards contained in it, and the number of yards considered as a fair day's work per man (which has been done, and found to substantiate the above), but on the Isthmus, where a day's work is a very uncertain quantity, it is more satisfactory to estimate from what has been done under similar circumstances, and, estimating in this way, it appears that the road can be completed from ocean to ocean, by August 1st, 1854, by the number of men mentioned above.

The question now comes, appropriately: Can this number of men be obtained?

In answer to which, I would make the following statement:—

The force on the road now is,

Native laborers, Jamaica men and Coolies, .	1200
White men, . . .	390
Total,	1590
Arrangements which can be depended upon are made for bringing to the work from the Province of Carthagena, and adjacent country, by January next, New Grenadian natives, . .	2000
Further arrangements are made for bringing from other parts of that Republic 1000 men, from which may fairly be expected,	500
Your Board has ordered from China (Coolies)	1700
And from Ireland,	1000
Total	6790

In addition to which, you are forwarding to the work from this country about 150 laborers and mechanics monthly.

As to the character of the laborers above enumerated, it may be well to say a few words.

Irish laborers are not so efficient on the Isthmus as in cooler and healthier climates; yet, for a period of from four to six months, which is the term of their engagement, they perform a fair amount of work.

The Coolies are at first feeble and inefficient, but being steady workmen, temperate, and but little affected by the climate, as they become accustomed to the use of the tools, and acquire strength from regular and wholesome food, they make useful workmen.

The natives from the province of Carthagena are as accustomed to the pick, shovel, and wheelbarrow, as are Irishmen. For the past nine years, this portion of the laboring population of New Grenada has been under my employment. Many of them have grown up from boys to the use of these implements. They are an elastic, hardy race, and in all respects

the most efficient common laborers that can be employed on your work. They are, also, excepting the Coolies, the most economical.

An exact estimate of the cost of work on the Isthmus, even after the years of experience I have had in that country, I should not pretend to make. The reason for which is obvious. The line of the railroad affords nothing which can be used in its construction. All materials are imported there. Even the timber for the cross ties is carried there from this country, or from distant parts of New Grenada. The workmen, whether native or foreign, are conveyed there for the express purpose of that work, at a cost of from fifteen to fifty dollars each. Sickness, although bearing no comparison to the exaggerated reports which have been circulated in regard to that work—not even amounting to the average sickness on the public works in many of our Western States—is a serious item of expenditure. The following estimate, however, I consider sufficient to cover the cost of reaching the Pacific in the mode contemplated, the items of which are derived from the profile of the line as located, and the prices are such as have been found sufficient on the work already done on your road.

571,000 cubic yards of Excavation and Embankment, at $1·40,	$799,400
28,000 do do Rock, $4·00,	112,000
18 Miles of Track, including cross ties, $7300 per mile,	131,400
Temporary Bridges, . . .	94,000
Grubbing and Clearing, ...	10,000
Cost of completing the 18 miles now under construction,	$1,146,800
To which add cost of repairs, and expenditure on construction of unfinished work between Aspinwall and the Obispo,	280,000
Total expenditure required to reach the Pacific terminus,	$1,426,800

The iron for the whole road is on the ground, having been purchased at an early period of the work, and therefore does not enter into an estimate of expenditure yet to be made.

G. M. Totten, *Chief Engineer.*

New York, Nov., 1853.

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*Statistics of Railway Rolling Stock in Great Britain.**

It appears from a return that the total number of locomotive engines on railways in the United Kingdom is 3942, being about one locomotive to every two miles of railway; the number of first class carriages 2413, capable of holding 49,226 passengers; the number of second class carriages 3413, capable of holding 124,703 persons; the number of third class carriages 2954, capable of holding 121,807 persons; the number of composite carriages 1114, capable of holding 35,239 persons; and the number of other carriages 1470, capable of holding 4231 persons—making together 11,364 carriages, capable of holding 335,206 passengers. The number of horse boxes is 1547, capable of holding 4547 horses; the number of cattle wagons, 7127, capable of holding 76,696 head of cattle. The number of carriage trucks is 1561.

* From Herapath's Journal, No. 750.

Of the 3942 locomotive engines, 3221 are used on railways in England and Wales, 527 on railways in Scotland, and 194 on railways in Ireland. Of the 2413 first class carriages, 1967, capable of holding 40,005 persons, are on railways in England and Wales; 346, capable of holding 6252 persons, on railways in Scotland; and 100, capable of holding 2969 persons, on railways in Ireland. Of the 3413 second class carriages, 2846, capable of holding 104,811, persons are on railways in England and Wales; 396, capable of holding 10,930 persons, on railways in Scotland; and 171, capable of holding 8962 persons, on railways in Ireland. Of the 2954 third class carriages, 2204, capable of holding 93,235 persons, are on railways in England and Wales; 545, capable of holding 17,743 persons, on railways in Scotland; and 210, capable of holding 10,829 persons, on railways in Ireland. Of the 1114 composite carriages, 822, capable of holding 26,635 persons, are on railways in England and Wales; 210, capable of holding 4846 persons, on railways in Scotland; and 82, capable of holding 3758 persons, on railways in Ireland. Of the 1470 other carriages, 1305, capable of holding 2961 persons, are on railways in England and Wales; 101, capable of holding 820 persons, on railways in Scotland; and 64, capable of holding 450 persons, on railways in Ireland. Of the 1547 horse boxes, 1282 capable of holding 3751 horses, are on railways in England and Wales, 162, capable of holding 486 horses, on railways in Scotland; and 103, capable of holding 310 horses, on railways in Ireland. Of the 7127 cattle wagons, 5892, capable of holding 67,319 head of cattle, are on railways in England and Wales; 745, capable of holding 5423 cattle, on railways in Scotland; and 490, capable of holding 3954 cattle, on railways in Ireland. The number of carriage trucks on railways in England and Wales is 1311, in Scotland 165, and in Ireland 85.

On the broad, or 7 feet gauge lines, the working stock consists of 239 locomotive engines, 197 first class carriages, capable of accommodating 5880 persons; 259 second class carriages, capable of holding 17,150 persons; 71 third class, capable of holding 4632 persons, and 44 composite carriages, capable of holding 2029 persons; 168 horse boxes, capable of holding 647 horses; 1492 cattle wagons, capable of holding 11,699 cattle; 230 carriage trucks, and 103 vans.

On the narrow, or 4 feet 8½ inch gauge lines, in England and Wales, the working stock consists of 2982 locomotive engines, 1770 first class carriages, capable of holding 34,125 persons; 2578 second class carriages, capable of holding 87,661 persons; 2133 third class carriages, capable of holding 88,603 persons; 778 composite, capable of holding 24,606 persons; 1202 other carriages, capable of holding 2961 persons; 1114 horse boxes, capable of holding 3104 horses; 4440 cattle wagons, capable of holding 55,620 head of cattle, and 1081 carriage trucks. They are all narrow gauge lines of 4 feet 8½ inches in Scotland; the gauge of railways in Ireland is 5 feet 3 inches. The working stock on these lines is stated above.

For the Journal of the Franklin Institute.

Quantity of Coal Shipped at the Port of Pictou, in British and American Ships, to the United States, to August 25, 1853.

Communicated by W. H. Shock, Esq., Chief Engineer U. S. Navy.

Years.	British Ships. Tons.	American Ships. Tons.	To Brazils in American Ships. Tons.
1846	28,000	30,303	
1847	49,135	41,343	
1848	43,225	33,333	240
1849	43,350	25,335	
1850	49,450	21,903	
1851	35,174	8,558	
1852	55,277	18,525	1070
1853 to date	35,000	9,000	
Total.	333,611	188,280	1310

*Experiments in Stopping Trains.**

Some experiments were made on the Great Southern and Western railway during the inquest to try the effect of the brakes in stopping the trains.

The first experiment was with an engine 22 tons, tender 10 tons, 17 wagons loaded, and 3 carriages, weighing together 145 tons 12½ cwt., and the speed above 20 miles an hour. Owing to not having heard the whistle, the guard of the brake van did not apply his brake until some little time after the fireman had applied his to the tender. As it was, the train stopped in 1½ minute, and in 915 yards, or 35 yards above a half mile.

In a second experiment, with a speed under 25 miles an hour, the brakes being well and simultaneously applied, the train was brought up at 637 yards.

A third trial gave 804 yards, with a speed of better than 32 miles an hour.

Nothing is here said of the gradient of the line, nor which way it inclines, which are very material points in the question.

AMERICAN PATENTS.

List of American Patents which issued from November 15, to December 6, 1853, (inclusive,) with Exemplifications by Charles M. Keller, *late Chief Examiner of Patents in the U. S. Patent Office.*

NOVEMBER 15.

49. For an *Improvement in Looms for Weaving Pile Fabrics,* Erastus E. Bigelow, Boston, Massachusetts.

Claim.—"What I claim is, 1st, The method of constructing and operating the pincers,

* From Herapath's Journal, No. 750.

or other equivalents, for successively operating the pile wires, so that they shall carry said pile wires forward to the face of the cloth, and hold them in position with their proper edges upwards, until they are otherwise secured, substantially as specified. I also claim constructing the pincers for successively operating the pile wires with grooved jaws opening and closing in a line with the pile wire, and with a motion in advance of the lathe, substantially as specified, whereby collision with the lathe is easily avoided. I also claim the application of long horizontal guides, substantially in the manner and for the purpose specified. I also claim the application of a vibrating box or holder, in combination with the pincers, or their equivalents, for successively operating the pile wires, substantially in the manner and for the purpose specified. I also claim, in combination with the pile wires, a bar or guide, which shall successively press against said pile wires, to keep them in a proper position during the operation of cutting, substantially as specified. And, finally, I claim the method of applying the tension weight and brake to the whip roller by means of the arms, substantially in the manner and for the purpose specified."

50. For an *Improvement in Power Looms;* John Gledhill, City of New York.

Claim.—"What I claim is, 1st, The combination of the main connecting rods, links, and radius rods, substantially as described, for giving the lay a motion, the forward part of which is accelerated, and the backward part is retarded, for the purpose set forth. 2d, The 'automatic server,' consisting of a block or head furnished with any number of hooks, or analogous devices, arranged in any number of series, according to the number of bunches of filling hair or threads, and in order of succession; the said block or head being hung, substantially as described, on a pivot, in such a position that when a proper amount of circular motion is given to it by suitable mechanism, the hooks will withdraw the hairs from one or other of the bunches, and bring them to a suitable position to be taken by the nippers, or other device, which draws them through the warp. 3d, A pair of nippers, which are operated by suitable mechanism, substantially as described, to make their jaws pass through the warp from one side thereof every time the shed is opened, seize one or more hairs or threads from the opposite side, and return through the open shed with the same, and release the same when it is beaten up and the shed is closed. 4th, The combination of the fixed stud, finger, lever, spring, and arm, substantially as described, the stud, finger, and spring being for the purpose of producing a proper tension on the hairs or threads as they are being drawn through the shed, and the lever and arm being for the purpose of moving the finger to allow the nippers to pass in coming to fetch the hairs or threads."

51. For *Supplemental Valve to the Equilibrium Pipe of the Cornish Engine;* Henry P. M. Birkinbine, Philadelphia, Pennsylvania.

Claim.—"I wish it to be understood that I do not confine myself to the particular form of supplemental valve described, or to the particular method shown of actuating the same; it will be easily seen that a slide valve might answer the same purpose as the former, and that various mechanical devices might be substituted in place of the latter; but what I claim is, the use of the adjustable valve apparatus described, or any equivalent to the same, for intercepting, more or less, the steam in the equilibrium passage, so as to regulate the rapidity of descent of the plunger, according as the head of water may require."

52. For an *Improvement in Daguerreotype Apparatus;* James Brown, City of N. Y.

"The nature of this invention consists in the employment of an ornamental diaphragm, with a suitable opening placed in a suitable position in front of the person or subject to be represented, for the purpose of producing a portrait or picture, with an appropriate or tasteful ornamental border, either with or without the name of the person or subject, and the name of the artist. The diaphragm may be, and will be mostly, used in conjunction with a back ground, such as is now sometimes used, illustrative of the character of the person or subject represented."

Claim.—"What I claim is, the employment of a diaphragm with a suitable opening, through which the person or subject is presented to the camera, when the said opening is surrounded by ornament or embellishment, substantially as described, for the purpose of producing a portrait or picture with an ornamental or embellished border."

53. For an *Improvement in Electro-Magnetic Annunciators;* Charles S. Bulkley, City of New York.

Claim.—"What I claim is, the circuit closer, constructed in such a manner, in combination with the permanent arrangement of the several numeral characters and words or

sentences necessary to designate the number of each room, and the ordinary desires of the lodgers, upon concealed register plates, which are connected with and operated by electro-magnets, through suitable escapement, or other equivalent devices; that, by a single sweep of the key to the point denoting the particular communication the lodger wishes to make, the circuits of the said magnets will be closed and broken the required number of times to strike the bell, and exhibit, through apertures in the face of the register, that number and word or sentence of the said register plates which respectively designate the number of the lodger's room, and the communication made by him, substantially as set forth."

54. For a *Machine for Dressing Staves;* Joseph D. Elliot, Leicester, Massachusetts.

"The nature of my invention relates more particularly to the use of a transversely inclined bed, upon which the staves are fed into the cutters, so as to adapt the machine to the dressing of thick or thin, tapering or wedge shaped riven staves, with the grain of the wood, without separately adjusting the machine, or assorting the staves."

Claim.—"What I claim is, the combination of the transversely inclined bed with the swiveled roller, for the purpose of adapting the machine to the dressing of riven staves with the grain of the wood, whether thick or thin, tapering, or inclined from edge to edge, without any separate adjustment for the various sizes, substantially as described."

55. For an *Improved Chuck for Cutting Barrel Heads;* Franklin Fruit, Jefferson City, Missouri.

"The nature of my invention consists in holding the material of which the barrel head is cut by means of a chuck, having a series of centres, placed in circular form, and concentric with the periphery of the chuck. Each centre is provided with a spiral spring, which enables the centres, individually, to give or yield, so that the different pieces forming the barrel head may vary in the thickness, and still be firmly held by the chuck, as will be presently shown."

Claim.—"What I claim is, the chuck, constructed substantially as shown and described, viz: two circular disks, connected by studs and centres, placed between the studs, any proper number of studs and centres being used, said centres passing through both the front and back disks, and having collars upon them, each centre being provided with a spiral spring, which is placed between the collar and the inner side of the back disk, and by which springs each centre will yield or give, independently of the others, so that the different pieces forming the barrel head may vary in thickness, and still be properly adjusted and secured between the face plate and chuck, as set forth."

56. For *Improvements in Propellers;* Banford Gilbert, Pittsburg, Pennsylvania.

Claim.—"I do not desire to claim the use of submerged propellers, actuated by a reciprocating motion, nor the use of propellers with two levers or floats, hinged at or near their point of connexion, and operating by opening and closing as they pass to and fro through the water, as in the case of the duck's foot propeller; but what I do claim is, the combination of the anchors with the double floats or paddles, suspended so as to hang vertically in the water when in use, and operating with a horizontal reciprocating motion, one of the floats in each set propelling the boat in one direction, and the other float in each set propelling it in the opposite direction. One anchor being combined with each set of double floats for the purpose of retaining one float in a horizontal position, so as to pass through the water with the least possible resistance, when not in use, and sustaining the pressure of the water against the paddle in use, when in the vertical position, which the anchor compels it to retain while propelling the boat, and leaving it free to assume the angle of least resistance while returning through the water. The simultaneous reversing of the double paddles being accomplished by means of a handle which shifts the connecting rod, to which all the anchors in one frame are attached, in the manner described."

57. For a *Machine for Dressing Circular Sash, &c.;* Leonardo Gilson, Brighton, Mass.

Claim.—"What I claim is, 1st, The swing bed frame and adjustable bed plate, in combination with the lever, clamps, and set screws, substantially in the manner and for the purpose set forth. 2d, I claim an angle frame with a joint at or near the vertex, to increase or diminish the angle with a movable segment plate thereon, in combination with the bed plate and cutters for circular work, as described."

58. For an *Improvement in Machines for Creasing Straps of Leather;* Daniel H. Hovey, Kilborn, Ohio.

Claim.—"What I claim is, the combination of the self-adjusting creasers, springs, vibrating cam, and pressure roller, arranged and operating substantially in the manner and

for the purpose set forth. The above specification of my improved machine for creasing straps and other forms of leather for harness and other purposes, signed by me this third day of March, 1853."

59. For *Improvements in Ventilators;* Joseph Leeds, Philadelphia, Pennsylvania.

"The nature of my invention consists in arranging a series of downwardly inclined curved openings in the outer case or shell of the ventilator, for taking in and directing downward into the building to be ventilated, a current or currents of pure air, and in connecting therewith a passage in the centre of the ventilator, through which the impure air may be drawn upward by an accumulated or increased draft over the top of said passage; also, in the manner of increasing the draft across the top of the ventilator to aid the upward current of air through the centre passage."

Claim.—"What I claim is, the combination, in one case or shell, of the series of downwardly inclined curved openings in the outer shell, for taking in and directing downward a column of pure air, with the centre pipe or opening crowned with the two frustrums of cones, with their apices towards each other, for producing a counter current, and carrying from the apartments to be ventilated the impure air, and increasing said ejecting current, substantially as described, the whole requiring but a single opening in the roof."

60. For an *Improved Coating Box for Daguerreotype Plates;* Wm. Lewis and Wm. H. Lewis, City of New York.

Claim.—"What we claim is, 1st, The metallic base, formed as a box, to which either cold water or heat are to be applied to regulate the temperature of the chemicals in the coating box, as described. 2d, Suspending the glass pot within the coating box by means of a flanch or bead on the upper edge thereof, taking the upper surface of the box, as specified. 3d, We claim the rollers, in combination with the ways, formed with the inclines to relieve the friction, as specified. 4th, We claim the rollers on the cover, combined with the ways and inclines on the slide, to lift the cover and relieve friction, as specified. 5th, We claim the rebates, to support the glass on the lower surface thereof, in combination with the screws, to retain the same against the rebates, as specified. 6th, We claim securing the metal yoke in place by ribs on the inner sides of the vertical parts thereof and the slides, as described. 7th, We claim the hub on the yoke, taking the socket in the cover, and containing the spring, whereby the cover is retained in place, but allowed to take its proper bearing, as described."

61. For an *Improvement in Self-Acting Dampers for Air Tight Stoves;* Sergius P. Lyon, Farmington, Michigan.

Claim.—"What I claim is, the arrangement of the lever, having the valve on its lower end, and a curved portion and flat spring on its upper end, in combination with the lever pivoted between the curve portion and spring, (said lever attached to the upper valve,) the thumb screw, and expansible plate; the whole operating automatically in the regulation of the draft of air to the fire, and also to the induction of air to the flue, in the manner set forth."

62. For an *Improved Paddle Wheel;* William Henry Muntz, Norton, Massachusetts.

Claim.—"The mode of making the paddle wheel is claimed by me, such mode consisting, 1st, In making the supports of the buckets, a cut-water wheel, and two wheels of smaller diameter. 2d, Of forming each bucket of a float and guard made to stand at an angle to each other. 3d, Of making the guard to extend from the rim of the cut-water wheel to the other or smaller wheel, and so that the guard shall not only pass edgewise through the water, but endwise into the water, the float being made to project inwards from the guard, as stated. And, in combination therewith, I claim making the float narrowest at its outer end, or at the cut-water wheel, and gradually increasing in width towards its inner end, as described."

63. For an *Improvement in Seed Planting Cultivators;* George Phillips, Philadelphia, Pennsylvania.

"The nature of my invention and improvements consists in so constructing, combining, and adapting the several parts of the planter, harrow, and cultivator plough, as to enable them to be separated or attached at the will of the operator, and to perform either of the functions for which they are designed in a more effective manner than heretofore; and also, in attaching to the upright post, at the back part of the centre or draft beam, a gra-

duating and driving wheel, capable of being either used for those purposes, or as a pivot wheel to turn the machine on when it is desired to do so for any purpose."

Claim.—"What I claim is, the arrangement and combination of the side pieces, slotted beam, and slotted bars, and the hollow sectional axle or shaft, for the purpose of allowing the expansion and contraction of the side pieces, in the manner and for the purpose set forth. I also claim attaching the driving and graduating wheel to the back part of the machine by means of the notched bars, secured to the upright post of the centre or draft beam by a bolt upon which they move, and suspending above the same pawls, which enter the notches, thus enabling said wheel to perform its functions of regulating the height of the back part of the machine and driving the distributing shafts, and to be drawn or thrown under the centre or draft beam to form a pivot wheel, upon which the machine can be raised from the ground and turned, in the manner and for the purpose specified."

64. For an *Improvement in Mop Heads;* Timothy Randlett, Enfield, New Hampshire.

Claim.—"What I claim is, the binder and revolving tightener, combined with and embracing the united cross-head, the socket, and ridge, substantially in the manner and for the purpose set forth."

65. For an *Improvement in Feed Rollers of Straw Cutters;* Robert Sinclair, Jr., and Richard F. Maynard, Baltimore, Maryland.

Claim.—"What we claim is, the employment of alternate right and left fins, so arranged as to form a double spiral or screw, said fins being formed substantially as set forth, and operating together, so as to prevent the straw from crowding to the right or left, and to compress the straw laterally as it is passed to the knives, and constituting altogether what we denominate the double screw propeller for straw cutters."

66. For an *Improved Machine for Trimming Soles of Boots and Shoes;* John H. Thompson, James M. Thompson, and Hosea Q. Thompson, Holderness, N. H.

Claim.—"What we claim is, a machine in which the sole is 'trimmed' by revolving knives, and guided, as fed along by the operator, by an adjustable gauge bar, against which the edge of the pattern plate abuts, substantially as described."

67. For *Hot Air Registers;* William H. Towers, Philadelphia, Pa.

Claim.—"What I claim is, the placing within the jambs of each register, the means of moistening the heated air, as described."

68. For an *Improvement in Looms;* William Townshend, Hinsdale, Mass.

Claim.—"I do not claim the levers in themselves, as these have before been used; neither do I limit myself to the number of heddles and treadles; and I do not claim the pattern chain in itself, as this is well known: but what I claim is, the levers on a slotted fulcrum, with their latch pieces, or their equivalents, combined with the levers, by which arrangement the levers are connected to either lever by means of the end motion, and carried up and down by competent power applied to the levers."

69. For a *Machine for Finishing the Ends of Staves;* J. E. Warner, Boston, Mass.

"The nature of my invention consists, 1st, In the use of circular saws to cut the staves to equal lengths. 2d, In the use of revolving cutter-heads, having in each three sets of movable and adjustable cutters; the first set for forming the bevel on the ends of the staves; the second set for equaling the thickness of the staves at each end; and the third set for cutting the grooves for the heads. 3d, In the use of a rotary bed, which, slowly revolving on its axis, carries the staves to the saws and cutters, and deposits them when finished on the opposite side of the machine. This bed is made to yield to the varying thickness of the staves, and by means of weights, the staves, while being wrought, are kept steadily in contact with fixed stops."

Claim.—"I do not claim a feed bed revolving in fixed bearings as any novelty; but what I claim is, a feed bed revolving in bearings which are capable of being moved by weights, springs, or other means, towards the beds or stops on which the back or outer side of the stave is supported, the extent of such movement depending upon the thickness of the staves operated on. I also claim the combination of said feed bed with the saws, cutters, fixed stops, and movable frame, and what are substantially their equivalents, operating in the manner described, for the purpose of finishing the ends of staves."

70. For an *Improvement in Safety Valves for Locomotive Engines;* Henry Waterman, Hudson, New York.

Claim.—"What I claim is, the piston attached to the weighted end of the valve

lever within the cylinder, and immersed in the liquid in the cylinder, combined and operating in the manner and for the purposes described."

71. For an *Improvement in Uniting Shovel Blades to Handle Straps;* Jonathan White, Antrim, N. H.

Claim.—"I claim the uniting by welding of the iron handle straps to the sheet cast steel blade in the manner substantially as set forth."

72. For an *Improvement in Rotary Churns;* Hosea H. Grover, North Cohocton, N. Y.

Claim.—"I do not claim a churn tub in the form of an inverted cone or conic frustrum with revolving dasher, either with or without breakers, as such churns with breakers and dashers extending from the bottom to the top of the tub, or with dashers without breakers, have been used before: but what I do claim is, a churn, consisting of such conical tub, furnished with a vertical revolving dasher at its bottom, combined with breakers at the top, in the manner and for the purpose set forth."

73. For a *Machine for Dressing Crooked Timber;* Evan H. Branson, assignor to Franklin Slaughter, Fredericksburg, Va.

"The nature of my invention consists in supporting the arbor of one of two pulleys, carrying an endless belt of knives upon elastic bearings, arranged and operated as set forth."

Claim.—"What I claim is, supporting the arbor of one of two pulleys, carrying an endless belt of knives, for dressing crooked timber upon elastic bearings, for the purpose of yielding to any undue strain upon the knives, substantially as described."

NOVEMBER 22.

74. For *Improvements in Joining and Riveting Metallic Plates;* William Beschke, Alexandria, Virginia.

"The nature of my invention consists in joining and riveting plates together in such a manner as to give the greatest strength to the whole."

Claim.—"What I claim is, the method of equally dividing the weakness resulting from the joining of iron, steel, or any other metallic plates, and is effected by putting said plates together so as to break joint at the ends, and riveting over these another similar set of plates so as to break joint at the sides and ends with the first, thus entirely covering joints of the first, the rivets over the surface being equi-distant from each other, and from those confining the edges."

75. For an *Improvement in Body Braces;* Gardner S. Browne, M. D., Hartford, Conn.

Claim.—"What I claim is, uniting the shoulder and abdominal brace by pliable springs, so arranged and constructed that they shall be confined on each side of the spine to the abdominal brace, and when fastened at one end permit a limited vibration, and when fastened to the other end be rigid, in the manner described; whereby the same brace can be adapted to a variety of patients in different stages of disease, or to different stages of disease in the same patient."

76. For an *Improvement in Nut Machines;* Henry Carter and James Rees, Pittsburg, Pennsylvania; ante-dated June 3, 1853.

Claim.—"What we claim is, the arrangement of the devices substantially as described, for reducing the end of the blank bar to a given thickness preparatory to serving the blank, whereby nuts of uniform thickness are produced from bars of irregular thickness, and the machine is protected against injurious strains."

77. For an *Improvement in Transporting Bridges;* Thomas Champion and Samuel Champion, Washington, District of Columbia; ante-dated May 22, 1853.

Claim.—"We claim the improved method of operation described, viz: building bridges on shore on a level, or thereabouts, with their resting places on the abutments, and then setting them in place by moving them into position, substantially as set forth."

78. For an *Improvement in Ventilating Railroad Cars;* Stillman A Clemens, Springfield, Massachusetts.

Claim.—"I do not claim the conveying planes for gathering and condensing a current of air; nor do I claim a mode of filtering air by causing it to pass through a porous or

fibrous substance or material which is in a dry state, or unprovided with arrangements for securing a continual supply of moisture to replace that which is evaporated by the air passing through it; nor do I claim the arrangement for blowing the sparks outwards through a narrow opening in the back of the ventilator; what I claim is the mode of ventilating railroad cars, etc., by causing the air to pass through sponge, or other suitable, or porous or fibrous substance or material; said material being provided with means for a continual supply of water to moisten it, and replace that which is evaporated by the air which passes through it, substantially as set forth, and for the purpose specified."

79. For an *Improvement in Looms;* Oliver A Kelley, Woonsocket, Rhode Island.

Claim.—"What I claim is, 1st, The arrangement of levers, as described, connected by a spring or elastic connecting rod, in combination with the tappet wheel, whereby the shuttle boxes are raised and lowered by a yielding mechanism, which diminishes greatly the liability to breakage, as specified. 2d, The method of balancing the shuttle boxes on the lay, in combination with mechanism for simultaneously raising one set and depressing the other, substantially as specified. 3d, The reciprocating and rotating pattern cylinder, in combination with the vibrating lever or the equivalent thereof, for the purpose of rendering the intervals between the changes of the shuttles, regular or irregular, substantially as set forth. 4th, The rack cylinder, or the equivalent thereof, in combination with the two pinions and the mechanism for throwing them alternately into or out of gear, or the equivalent thereof, whereby the racks are moved in alternately opposite directions, with a variable range of motion as required for operating the pattern cylinder. 5th, A series of pins, or the equivalent thereof, on the inner end of the rows of holes in the pattern cylinder, a disk having a corresponding number of pins or teeth on its periphery placed loosely on the axis of the rack cylinder, and the pawls which turn the disk and pins, in combination with the rack cylinder, whereby the latter is turned at each extreme of its vibration, so as to throw one pinion out of gear with the racks, and the other in, to reverse the motion. 6th, The method of uniting the pattern cylinder, or its equivalent, with the rack cylinder, or its equivalent, by a yielding or slip coupling, operating substantially as specified, whereby the danger of breaking the mechanism when it happens to become deranged is greatly lessened. 7th, The method of working the same row of holes in the pattern cylinder to the right and left in succession, in case the cylinder should not have holes enough to work the ornamental design in the cloth by working the holes once only, whereby a cylinder of a given size will be capable of producing a much more elaborate design, or larger figure, than if the holes could be used but once in the production of the same figure."

80. For an *Improved Water Wheel;* Frederick Smith, Pontiac, New York.

Claim.—"What I claim is, the ventilating water wheels inclosed by a curb, scroll, or box, by means of a tube communicating with the wheel, or in any other manner substantially the same, in combination with the buckets, and constructed and arranged in the manner and for the purpose set forth."

81. For *Apparatus for Cutting Screws on Bedstead Rails;* James R. Kain, Tiffin City, Ohio.

Claim.—"What I claim is, the combination of the spiral faced plates, with the arms and spring for securing the rail in the machine, as specified. I further claim the catch, in combination with the notched tie and pins, substantially as specified, for carrying the right and left nuts against the screw and securing them in position, as set forth."

82. For an *Improvement in Boxes for Supplying Business Cards;* Wm. Lewis and William H. Lewis, City of New York.

Claim.—"We are aware that various apparatus has been used for supplying cards to be printed, but we are not aware of the slide, lip, and gate, having been used for the purpose, and as specified; therefore, we claim the lip on the slide, combined with the gate, to draw out one card at a time, as specified."

83. For an *Improvement in Platform Scales;* Samuel T. McDougall, City of N. York.

Claim.—"What I claim is, the arrangement of the triangular lever and the two independent side levers, having their long arms suspended from knife edges attached to said lever, whereby the final adjustment necessary to make the scale give the same weight on all parts of the platform may be made by moving the bar only, which carries the two last

named knife edges, without the necessity of any precise adjustment of the two knife edges upon the levers, to equal distances from the fulcra of those two levers."

84. For a *Machine for Cutting Screws on Bedstead Rails, &c.;* J. Parsons Owen, Norwalk, Ohio.

Claim.—"I claim nothing in the construction of the mandrels and cutters; but what I do claim is, supporting the mandrels in the oscillatory frame, as described, which, in combination with the lever and wedge, permits either mandrel to be brought effectually into operation for cutting, substantially as set forth. I also claim the eccentric grooves of the cams, in combination with the bars, substantially as and for the purposes set forth."

85. For an *Improvement in the Cutters of Grain and Grass Harvesters;* Wm. Pierpont, Salem, New Jersey.

Claim.—"What I claim is, hanging the cutter blade at each end to a crank, so as to cause the rotary draw cut in form of a circle, substantially as described, in combination with the counter rod, for insuring the perfect revolution of both shafts in unison."

86. For an *Improvement in Revolving Fire Arms;* Morgan L. Rood, Marshall, Mich.

Claim.—"I do not claim the revolving cylinder, nor do I claim the crank, rock shaft, tightening cam, tumbler, stirrup, revolving lever, or spiral spring, nor the ratchet teeth, nor the circular groove on the end of the cylinder, nor the adjusting spring, or the guard, or their equivalents, they having been before used; nor do I claim a slotted arm as merely connecting the hammer with the crank; nor do I claim the smoke guard; but what I do claim is, the peculiar arrangement in fire arms, described above, by which the guide pin, in combination with the stop notches, adjusting spring, and the hook connexion between the smoke guard and rock shaft, causes a more perfect joint, and more secure connexion between the cylinder and barrel, thus preventing all leakage, keeping the cylinder and its attachments clean, and protecting the surrounding charges from taking fire. I also claim the arrangement of the slotted arm and the hammer, by means of which the gun may be cocked, with or without moving the cylinder."

87. For an *Improvement in Blasting Powder;* William Silver, Jr., Pittston, Pa.

Claim.—"What I claim is, the blasting powder, as set forth, the same consisting in an unglazed powder composed of charcoal, nitre, and sulphur, in the proportions specified, prepared and treated with chlorate of potash, according to the directions, substantially as set forth. I do not claim the use of chlorate of potash as a means of preventing smoke in mine blasting, except when combined with charcoal, sulphur, and nitre, in the manner substantially as set forth."

88. For *Apparatus for Cutting Screws on Bedstead Rails, &c.;* Hiram Smith, Norwalk, Ohio.

Claim.—"What I claim is, 1st, The formation of the cutters, as described, in sections of the cutter heads, which are secured by means of screw bolts, substantially as set forth. 2d, Securing the section of cutter head containing the post cutter by means of a polygonal headed bolt, passing, as described, through the hollow spindle, cutter head, and section base, which arrangement, in addition to securely holding the cutter, admits of the adjustment of the cutter, as described, for insuring the formation of tight joints between the post and rail. 3d, The method described, of attaching the tenon socket to the spindle. 4th, The arrangement of the standards and clamp upon the blocks, by which the machine is secured to the post and rails, and the operation of cutting facilitated, as set forth."

89. For an *Improvement in Facing Ends of Percussion Caps;* Dr. James Goldmark, City of New York.

"The nature of my invention consists in inserting a series of percussion caps in appropriate holes made in a plate fitted to or making part of a stock, to be used in combination with the surface of a grinding wheel, or other reducing surface, so that when so inserted in the holes of the plate with the open end outwards, or towards the grinding or reducing surface, and moved over or caused to slide in a plane parallel with the grinding or reducing surface, or vice versa, and the said grinding or reducing surface set in motion, all the caps will be reduced to an equal depth, and the edges reduced to the same level."

Claim.—"I claim, in combination with the holding plate, substantially as specified, the employment of the guide plate, as specified, to facilitate the insertion of the caps into the holes of the holding plate, as set forth. I also claim, in combination, substantially as

specified, the employment of the plate with the series of punches or pins, as specified, for the purpose of forcing all the caps to the required depth in the holding plate."

90. For an *Improved Shingle Machine;* Enoch R. Morrison, Troy, Pennsylvania.

"The nature of my invention consists in carrying the riven shingle forward by an intermittent motion, so as to be operated upon successively by the shaving and edging knives, said motion being imparted by the reciprocating movement of the riving knife stock, through spring hooks, stops or dogs, or their equivalents."

Claim.—"What I claim is, the combination of a reciprocating river and finishing knife with a fixed knife, so that on the backward motion of the river one face of the shingle shall be dressed, and by its next forward motion the second face will be dressed by the fixed knife, substantially as described."

91. For an *Improvement in Platform Scales;* Elnathan Sampson, Cornish, N. H.

Claim.—"What I claim is, the combination of the sliding bars with the platform, the actuating levers, and the scale beam, in such a manner as to enable the platform to be laterally expanded or contracted, substantially as set forth."

92. For *Improvements in Bank Locks;* James H. Crygier, City of New York.

Claim.—"I do not claim the slotted disks, neither do I claim the index plate, nor the manner of adjusting the slotted disks, so that the slots in the disks may be placed in line with the ledges in the bolt, for circular plates having letters or characters upon them arranged with an index plate, have been previously used; neither do I claim the lever guards irrespective of the arrangement shown and described; but what I claim is, 1st, The employment or use of the lever guards, constructed substantially as shown, and arranged so as to operate against the disks, and prevent them from turning as the bolt tumbler is raised, as shown and described in the body of the specification. 2d, I claim connecting the ratchets to the circular toothed disks by means of pawls, and operating said pawls by means of the tumbler, or its equivalent, whereby the ratchets may be connected and disconnected from the several disks simultaneously, and the changes effected with the greatest facility."

93. For an *Improved Life Boat;* Lawrence F. Frazee, New Brunswick, New Jersey.

Claim.—"What I claim is, the combination of the balls as shaped and arranged with respect to each other, as described, with the frame which keeps them in shape and position, and is itself protected by the balsas; said frame being constructed substantially as described, and the whole constituting a life float, having the qualities set forth."

94. For an *Improvement in Grass Harvesters;* Wm. K. Hall, Phillippi, Virginia.

Claim.—"What I claim is, the tram, in combination with the staples on the arms, substantially as described, for the purposes specified."

95. For an *Improvement in Self Acting Presses;* S. R. Holt, Worthington, Ohio.

"The nature of my invention consists in a certain method of constructing a press, whereby the weight of the article being pressed, and also that of a certain portion of the press itself, is rendered available as a motive power for facilitating the operation and increasing the action of the press, and causing it to perform the pressing operation in a very gradual and effectual manner, and thereby save a large amount of the labor now expended in operating the ordinary presses."

Claim.—"I do not claim, in general, the device of making the weight of the article pressed act as the pressing power, by making the press itself rise and fall on a system of levers or other mechanical powers; but what I do claim is, so arranging the lever, and providing it with a self-adjusting follower, in combination with the lever and the bed plate with its supporting frame, that the motion of the article pressed may be transmitted to the long end of the lever, at or near the fixed centre of motion of the frame, causing the weight of the press and article being pressed to exert power on the follower, and thereby gradually press the article into a more compact and solid form, the power being increased, when the weight of the article is not sufficient, by means of the pinion and rack bar, which receive motion from a driving shaft, the whole being constructed, arranged, and operating substantially as set forth."

96. For an *Improvement in Machines for Dressing Mill Stones;* Willard B. Cummings, Tyngsborough, and Nathan P. Dadman, Chelmsford, Assignors to Willard B. Cummings, Tyngsborough, N. P. Dadman, Chelmsford, and Charles A. Blood, North Chelmsford, Massachusetts.

"Our improvement consists in causing the cam which actuates the pick to revolve upon

a block made fast to the stone or the mill bush, which block also serves as the bearing and guide for the head piece, which arrangement entirely prevents any tremulous or other motion from being communicated by the revolution of the cam to the bar, and the parts carrying and giving motion to the pick, which latter may at the same time be guided with the greatest nicety."

Claim.—"What we claim is, the combination of the pedestal, the head piece, and the cam, constructed and operating in the manner substantially as described, and for the purpose set forth."

NOVEMBER 29.

97. For an *Improvement in Fluid Lamps;* Samuel F. Allen, City of New York.

"My improvement consists in making the flame tube of greater length on either side of the vertical wick tube, and in combination with the same, encasing the wick which it carries inside of the fine wire gauze, which serves to give out the fluid in a spread and open state, and consequently to make the light more powerful, or brilliant and open, and also to preserve the wick a great length of time from being charred or consumed."

Claim.—"What I claim is, the horizontal flame tube for burning camphene and like fluid, having a long slit cut in its top, in combination with the wick, when encased in wire gauze, the encasing of the wick in gauze causing the fluid to be discharged and burned in a sheet the full length of the slit, in the manner described."

98. For an *Improvement in Condensing Smoke and Gases;* J. Bloom, East Woburn, Massachusetts.

"The nature of my invention consists in passing the smoke through water, it being conducted in pipes to the hollow of a suitable reservoir, made air-tight and nearly filled with water, which reservoir is kept constantly exhausted by air pumps."

Claim.—"I do not claim the use of revolving fans or blowers for the purpose of forcing air or smoke down through water for the purpose of purifying the same, as this has been tried before and found incapable of producing the desired result, the fan being powerless for the production of pressure to any practicable or useful extent, and will not answer for the purpose; but what I do claim is, passing the smoke of furnace or other fires through water by means of air pumps, in the manner described, and for the purpose set forth."

99. For an *Improved Gold Separator;* M. C. Gritzner, Washington, Dist. of Columbia.

"The nature of my invention consists in the arrangement of two or more screens, one having oblong and the other square meshes, the square meshes to be of the same size of the short diameter of the oblong meshes, for the purpose of separating and retaining the leaf or flake gold, and permitting the balance of the material to be subjected to a blast in uniform or nearly uniform sizes, so as to be differently operated upon by their different specific gravities; also, in the interposition of guide rollers, or their equivalents, between the shaking hopper and the blast, for the purpose of guiding or bringing the material in a proper manner to the blast."

Claim.—"What I claim is, the arrangement of the screens, (two or more,) one having oblong and the other square meshes, the square meshes being of the same size of the short diameters of the oblong meshes, for the purpose of separating and retaining the leaf or flake gold, and permitting the balance of the material to be subjected to the blast in uniform or nearly uniform sizes, so as to be differently operated upon by their different specific gravities, substantially as described. I also claim the interposition of the guide rollers, or their equivalents, between the shaking hopper and the blast, for the purpose of guiding or bringing the material in a proper manner to the blast, substantially as described."

100. For an *Improved Iron Fence;* Benjamin F. Miller, City of New York.

Claim.—"What I claim is, constructing the top and bottom rails in 'lateral halves,' and holding said halves together by screws, rivets, or bolts, in combination with 'bosses' or 'pivots' cast on the inside of the respective halves of the rail, with corresponding 'countersinks' or perforations near the ends of the 'filling bars.' "

101. For an *Improved Trip Hammer;* John W. Peer, Schenectady, New York.

"The nature of my invention consists in raising and lowering the hammer by means of a screw cam arranged upon a circular plate secured fast on a revolving shaft, and connected to the helve of the hammer by means of a horizontal lifting arm, which has one of its ends attached fast to the hammer by set screws, and its other end sliding freely up and

down over the vertical cam shaft as the hammer rises and falls, said arm carrying a small friction roller, which, as the cam shaft revolves, turns freely and plays upon the top of the screw cam, and prevents friction from the weight of the hammer upon the cam, as said hammer is gradually raised by the cam. 2d, In arranging the screw cam upon an adjustable frame, so that it may be adjusted to any position desired, and the length of the blow to be given to the hammer regulated, so that if a full or half blow be required they may be secured."

Claim.—"What I claim is, the arrangement of the screw cam and the adjustable table to which it is attached, for the purposes described."

102. For an *Improvement in Attaching Handles to the Blades of Table Knives;* David M. Ropes, Meriden, Connecticut.

Claim.—"I do not claim the right of soldering or brazing metallic handles on the blades of knives and forks, nor of uniting handles made of other materials in the ordinary way to the bolsters of table knife and other blades by mechanical means, for both of these have heretofore been done; but what I claim is, the use of the metallic cap interposed between the handle and the blade of the knife or fork, and secured to each, substantially in the manner described."

103. For an *Improved Arrangement of Valves, Ports, and Passages, for Operating Steam Hammers;* Robert R. Taylor, Reading, Pennsylvania.

Claim.—"I claim the arrangement, as described, of the steam ports and passages, the variable automatic valve for directing the steam alternately above and below the piston, and for admitting a variable quantity of steam beneath the piston, and the adjustable hand valve, to exclude altogether the steam from above the piston, or to admit a greater or less quantity of it, both valves being adjustable while the hammer is in operation, so that the steam can be made to act with a variable force on either the up and down strokes of the piston, or of both, or prevented from acting on the down stroke, without interrupting the action of the hammer, as set forth."

104. For a *Mode of Applying the Vibratory Spring of Balance Clocks;* Silas B. Terry, Plymouth, Connecticut.

"The improvement consists in the cheapness of construction of the escapement, as compared with the lever escapement and hair spring, as the parts which transmit the motive power of the clock to the balance and govern its vibrations are here combined in one, and the ordinary hair spring is dispensed with; likewise, there is less friction than in the lever escapement, as the impulse imparted by the lever to the balance is in a direct line with the motion of the balance."

Claim.—"What I claim is, the making the crutch spring perform the office of the common hair spring in producing the vibrations of the balance, substantially in the manner set forth."

105. For an *Improvement in Seed Planters;* R. C. Wrenn, Mount Gilead, Ohio.

"The nature of my invention consists in the employment, in the manner described, of the elbow slide shifters attached to the bottom of the slides, in combination with one or more cams arranged fast on the outer faces and near the periphery of the propelling wheels, whereby the slides can be moved inwards and outwards, and made to perform their functions at every quarter, half, or whole revolution of the wheels, as may be desired; by this very simple and utile arrangement, the necessity of employing shifting levers and other complicated mechanism to be operated by hand is dispensed with."

Claim.—"What I claim is, the combination of the slides, cams, and elbow levers or shifters, arranged and operating in the manner described, and for the purpose set forth."

106. For an *Improvement in Coupling Shafts to Axles;* Ephraim B. Benedict, Clinton, New York.

Claim.—"What I claim is, the coupling, consisting of the combination of the clip, tumbler, and draft iron, constructed and arranged as described, for the purpose of a secure and expeditious attachment of the shafts or pole to carriages and other vehicles."

107. For an *Improvement in Combined India Rubber and Steel Springs;* Erastus T. Bussell, Shelbyville, Indiana.

"My invention consists in a combination of vulcanized india rubber with spiral steel, so arranged that each sustains the other, and the good qualities of both are combined so as

to make a most perfect spring for elasticity and durability, which is applicable to railroad cars, carriages, buggies, &c., &c."

Claim.—"I do not claim the surrounding of columns of vulcanized india rubber with detached bands of metal at the ends, or any point between the ends, for springs; nor do I claim originality in the combination of metallic springs with vulcanized india rubber, as these are the subjects of patents heretofore granted to Fowler M. Ray; but as all known forms of such springs and combinations are liable to the following objections: 1st, An incapacity for great motion, this depending upon their outer surface being regular, and surrounded by bands of metal whose diameters are unvarying, together with the incorporating into the centre of said rubber springs, helical or spiral springs of metal, whose diameters increase with their compression, causing them thus to encroach upon the rubber centrifugally. 2d, The liability of such springs losing their elasticity and becoming worthless from the unequal exercise of their different parts; the stretching to their utmost extent the fibres at the circumference, and this at the expense of their vitality, whilst the centrifugal action of the helical spring within, serves further to embarrass it in its movements, so that a large mass of the rubber is rendered inert, by being confined between the almost lifeless circumferal rubber and the centrifugally acting helical spring; the rubber thus circumstanced may properly be compared to an elastic arch with the burthen or force applied to its concave side, without any base upon which to rest, save that of its own external fibres; and, 3d, Their great liability of being crushed by an over load for the want of a continuous metallic support externally; but what I claim is, not the surrounding a column of vulcanized india rubber with a helical spring, as that is the subject of a patent granted to F. M. Ray, but the fluting a column of vulcanized india rubber longitudinally, and then so surrounding it with the helical spring, mine being an improvement upon Ray's spring."

108. For an *Improvement in Stone Saws;* Samuel Chapman, Jr., City of New York.

"The nature of my invention consists in the application, adaptation, and arranging a series of circular saws, attached in alternate countersinks or perforations to the sides near the edge of a straight or the periphery of a circular driving plate, in such a manner as to cut an entire kerf of sufficient width to allow the combination of saws and their fastenings to pass through in like manner as a saw of ordinary construction, changing by this combined arrangement, the cut or working effect of the teeth from the ordinary drawing cut parallel with the line of motion, to the effect or cut of the edge of a chisel or drill driven from, and nearly perpendicular thereto, pressed unto and penetrating the stone in direction, and by force and leverage resulting from motion consequent upon this combined arrangement."

Claim.—"What I claim is, the application, adaptation, and arranging, as described, or in similar manner, a series of circular saws, whereby I obtain from this combination of parts and motions, the desired or above described mode and effect of sawing or severing stone."

109. For an *Improvement in Machines for Washing Ores;* Richard Edwards, Eagle River, Michigan.

Claim.—"What I claim is, the rotating hopper and the suspended oscillating basin, arranged and operated as described."

110. For an *Improvement in Tightening Packing of Engine and Pump Pistons;* John Crabtree and Joseph Hopkinson, Philadelphia, Pennsylvania.

Claim.—"What we claim is, tightening the packing of the piston by the rod passed down through the hollow piston rod and attached to follower, the nuts, key, and hollow piston rod, combined and operating substantially as described."

111. For a *Shingle Machine;* Israel Graves and Charles A. Bogert, West Dresden, N. Y.

"Our invention consists in the employment of a gang of stationary and movable vertical saws hung in an ordinary saw gate, and so arranged, in connexion with cams, or their equivalents, that the movable saws will be caused, as the gate moves up and down, to have a gradual lateral movement from and toward the stationary saws as the stuff is fed in, and also, at the same time a movement out of a parallel line with the direction of feed communicated to them, and they consequently caused to cut in an inclined direction or line, instead of in a direct line, and thereby give the proper shape and taper to the shingle from tip to butt, as described; the said saw gate being operated vertically by a crank and the cams by means of gearing which is attached fast to the saw gate, and moves up and down

with it, and the feed rollers being actuated by gearing arranged on the stationary part of the frame."

Claim.—"What we claim is, a machine for sawing shingles, and which may be adapted to sawing other irregular shapes, constructed with a gang of stationary and movable saws, arranged vertically in a saw gate which moves up and down; the movable saws of said gang being caused to give a gradually lateral movement from and toward the stationary saws while cutting, by means of grooved cams, which operate upon the pintle of the sliding bars, carrying the movable saws, and thereby communicate said lateral movement to them, the said saws at the same time having a movement slightly out of a parallel line with the direction of feed communicated to them by other cams, which operate upon the pintle of the sliding bars, the said movements causing the stuff to be cut tapering, or of any required form, substantially as described."

112. For an *Improvement in Supporting Falling Table Leaves;* Charles Phelps, Salem, Massachusetts.

Claim.—"I do not claim merely the application of a hinged brace for supporting the leaf of a table, as that is a device well known for like purposes; nor do I claim the making it slide in a staple or guiding aperture; neither do I claim the use of a spring for throwing it into its catch, merely as such; but what I do claim is, the application to the falling leaf of a table, of a hinged supporting brace, in the form of a bent lever combined with a spring on the under side for throwing it upward into its catch, whereby the table leaf can be conveniently released to let down by a pull at the short arm of the bent lever, as described."

113. For an *Improvement in Forming Hydraulic Cement Pipes;* John B. Poague and William F. Poague, Fancy Hill, Virginia.

Claim.—"What we claim is, 1st, in combination with the moulds permanently lined with cloth or other porous flexible material, the air spaces intermediately placed between the fastenings of the cloth, so that it may give to the pipe or mould as it is stripped from the pipe, substantially as described; we also claim the manner of withdrawing or stripping the cloth from the inside of the freshly formed pile, by attaching it to the end of the mandrel, so that in withdrawing the mandrel, the cloth will turn inside out and strip from the pipe, substantially as described."

114. For an *Improvement in Machines for Polishing Leather;* Fred. Seibert, Williamsburg, New York.

Claim.—"What I claim is, the circular or curvilinear glass rubber, combined with giving it a tilting motion for the purpose of enabling it, after passing off the edge of the leather at the end of the stroke, to roll back and mount upon the leather without scraping it up, substantially as described."

115. For an *Improvement in Machines for Skiving Boot Counters;* Samuel J. Trofatter and Charles Trofatter, Salem, Massachusetts.

Claim.—"We are are aware that there is nothing new in combining feed and pressure rollers with guides and plane irons or cutters, for the purpose of reducing strips of board or other material; we therefore do not claim such; but what we do claim is, the peculiar arrangement of the axles of the pressure and draft rollers in convergent lines, in combination with the curved guides, as applied to knives; the whole being made to advance a curved piece of leather between the guides with an equality of pressure against the guides, or without such undue pressure against either as would cause one edge of the leather to be bent up and injured or imperfectly cut by the knives, while passing through the machine."

116. For an *Improvement in Combing Fibrous Materials;* J. Heilmann, Administrator of the Estate of Joshua Heilmann, dec'd., of France; patented in France, Dec. 17, '45.

Claim.—"What I claim is, 1st, The segment drum, constructed and arranged substantially as described. 2d, The jaws for griping and presenting the wool properly to the combs to be combed, and in connexion therewith, the bars and comb for delivering the wool. 3d, The rollers, or their equivalent, for seizing and retaining the wool as it is combed, and forming it into a continuous sliver, substantially as described."

117. For an *Improvement in Power Looms;* William Baird, Assignor to John James Hepworth, Philadelphia, Pennsylvania.

"The nature of my invention consists in an arrangement for immediately arresting the forward motion of the lay of a loom when a picker strap breaks, which arrangement at the same time is made to stop the motion of the loom."

Claim.—"I do not claim the method of shifting the driving belt from the fast pulley to the loose, and thus stopping the loom; but what I do claim is, the arrangement of the plate, with its spring, link, staple and pin, so that when a picker strap breaks, the picker staff will relieve the plate, and thus immediately arrest the forward motion of the lay, in the manner described."

118. For an *Improvement in Screw Jacks for Raising Buildings;* Frederick Nicholson, Warsaw, Assignor to Nelson A. Hume, Rushford, New York.

"The nature of my invention is such that a building may be elevated to any required height by means of a screw of convenient length (say two feet, more less,) without blocking up during the process."

Claim.—"What I claim is, the peculiar combination and employment of the hook, the lifting frame, the screw, the divided nuts, and the supporting frame, their combination being such that by the alternate employment of a pair of divided nuts, held stationary in transverse notches of the supporting frame, the screw may be continued up to any desired height, carrying with it the lifting frame, in which it is confined, and which slides in the longitudal grooves of the supporting frame, and carries along with itself the hook, substantially as described."

RE-ISSUES FOR NOVEMBER, 1853.

1. For an *Improvement in Planing Machines;* Aretus A. Wilder, Detroit, Michigan: patented 21st Dec., 1852; ante-dated 17th July, 1852; re-issued 15th Nov., 1853.

"The nature of my improvement consists in constructing planing machines so that the board to be planed can be clamped to the reciprocating bed, whilst being fed by the backward motion of the planes, so that the board will be free to move over the stationary bed plate upon which it is planed."

Claim.—"I disclaim the invention of planing by a reciprocating plane which planes on its forward stroke, and feeds the board on its backward stroke, the whole distance of the stroke of the plane, as in other machines of this class; but what I do claim is, 1st, The reciprocating beds arranged with respect to the stationary beds, substantially as described, in combination with the clamps, or their equivalents, attached to them, whereby the board is clamped between said movable beds and the clamps, and is free to move over the stationary planing bed, and is fed during the backward stroke of the planes the whole length of said stroke. 2d, I claim the described method, or any substantially the same, of clamping and feeding lumber to knives or chisels."

2. For an *Improvement in Oil Presses;* David L. Latourette, St. Louis, Missouri; patented Oct. 25, 1851; re-issued Nov. 22, 1853.

Claim.—"What I claim is, 1st, The pipes sliding into and out of stuffing boxes, in combination with the pressing plates, for the purposes and in the manner set forth. 2d, I claim, in combination with the pressing plates, the complete boxes or cases formed on the surface of the plates, as shown, where the openings to the said boxes or cases for the entrance or exit of the substance to be pressed, are closed with the doors and caps, as set forth, the cap sliding over and thus securing the doors when the press is brought into action; this combination, when used in connexion with a horizontal press, enables me to communicate and press the substance and discharge the refuse or cake without the use of bags or mats, and without handling, and at the same time to secure a perfect and free discharge of oil from the entire surface of the cake, through the metallic filterers and vertical channels. I do not claim the arrangement, in a horizontal press, of a series of pressing plates between which the substance is inserted, having been previously enveloped in strong cloths or mats; nor do I claim the arrangement, in a vertical press, of a series of partial cases, into which the substance is inserted, having been previously enveloped in strong cloths or mats, which in both these instances are necessary to convey the substance into the press, and to prevent it from pressing out laterally from between the plates in the one instance, and out at the end and through the cracks in the other."

3. For an *Improvement in Attaching Mineral Vitrifiable Matter to Metal;* Thomas G. Clinton, Assignee (through others) of Joshua Laird. (now deceased,) late of Cincinnati; patented May 22, 1849; re-issued Nov. 22, 1853.

Claim.—"What is claimed is, attaching mineral vitrifiable matter to metal by inserting a metallic tubular shank, involving the characteristics of thinness, yet stiffness enough to resist lateral strain, elasticity and centervent into the mineral vitrified matter, as herein

described, so that the quantity of metal, in proportion to the bulk of mineral, admissible in the case being thus very small, the vitrified mineral enjoys the capacity to embrace and attach itself to the metal without any strain in or upon itself during its crystallization, the difference between the expansibility and contractibility of the metal and the mineral, the one to the other, being also reduced below any practically injurious degree, that is to say, the glass being just as strong with as without such a shank."

DESIGNS FOR NOVEMBER, 1853.

1. For a *Parlor Stove;* Winslow Ames, Nashua, New Hampshire, Assignors to Hartshorne, Ames & Co., Boston, Massachusetts, November 1, 1853.

Claim.—"The ornamental design of the blower, and that of the fire place front."

2. For a *Parlor Stove;* Ezra Ripley and N. S. Vedder, Troy, Assignors to George W. Eddy, Waterford, New York, November 8, 1853.

Claim.—"The ornamental design and configuration of parlor stove plates."

3. For a *Cooking Stove;* N. S. Vedder, Troy, New York, November 8, 1853.

Claim.—"The ornamental design and configuration of cook stove plates."

4. For a *Sewing Butterfly;* John Lane, New Haven, Connecticut, Nov. 8, 1853.

Claim.—"I claim the device or design of a butterfly bending over a flower, when adapted and arranged for an instrument for holding sewing, or other like work."

5. For *Cooking Stoves;* Simon F. Moore, Batavia, New York, Nov. 29, 1853.

Claim.—"The design herein set forth."

DECEMBER 6, 1853.

1. For an *Improvement in Indicating Electro-Magnetic Telegraphs;* John Davis, New Bedford, Massachusetts.

Claim.—"The improvements which I claim as my invention consist in operating the electro-magnetic telegraph by means of the index or escape wheel, slider, and impeller, as set forth in this specification, and thereby spelling intelligence by pointing out the letters composing the words of the communication on a similar contrivance at the distant office to which the intelligence is sent by telegraph, disclaiming any right to other methods of telegraphing."

2. For an *Improved Arrangement of Screw Cutting Dies in the Die Stocks;* Simeon Goodfellow, New Orleans, Louisiana.

"The improvement as set forth consists in the adaptation to a purpose for cutting bolts and screws with circular dies and cutters, graduated to different sizes, as indicated by numbers thereon. In the stock are inserted two circular reversible dies, made a little tapering from their upper surface downwards; also, a rectangular die tapered in the same direction, (downward,) having a cross head key passing lengthwise and centrally through it, the head of the key (with a small nipper) fitting into a groove and a small hole near the centre of the groove in the small circular die or cutter, and pointing to a centre between the two circular reversible dies."

Claim.—"What I claim is, the arrangement of the circular dies, having threaded scores or recesses in their various depths or sizes in the die stock, substantially as described."

3. For an *Improvement in Pen Holders;* Ebenezer W. Hanson, Spring Garden, Pa.

"The nature of my invention consists in a peculiar mode of constructing a pen holder with thumb and finger rests, or in the application to the barrel of a pen holder, rests or holds for the thumb and middle finger, of a peculiar construction, whereby a better hold and a more easy and certain command of the pen is afforded."

Claim.—"What I claim is, the peculiar mode in which I construct and apply thumb and finger rests to pen holders, viz: I claim making the projecting part of the thumb and finger rests of an oblong or parallelogramic form, so that they shall cross the thumb and finger respectively, when held for use, whether the rest be fixed or made adjustable."

4. For an *Improved Spark Burner and Water Heater for Locomotives;* David Matthew, Philadelphia, Pennsylvania.

"The nature of my invention consists in constructing and providing the engine with an apparatus which receives and consumes the sparks, presents an inner water surface to their fire, an outer and also central water surface to the heat from the flues of the boiler, and heats the feed water in the reservoir or space between these water surfaces for supplying the boiler, by which the sparks are saved and utilized, and the generation of steam increased."

Claim.—"What I claim is, the arrangement and application of the two concentric pipes, the curved plate rings, the pipes, the furnace grate, the cover and pipes, and forming a combined apparatus in the smoke box for burning the sparks and heating the feed water, substantially as described."

5. For an *Improvement in Soap Ingredients;* Ira F. Payson, City of New York.

"The nature of my invention consists in the employment of sal ammoniac in the manufacture of soap, in combination, in part or in whole, with wheat flour, potatoes, borax, sal soda, 'meen fun,' or satin white, and fuller's earth, or their equivalents, the combination being a soap which maintains its consistency in all states of the atmosphere, either moist or dry, and which will wash in water either hard or soft, retaining a sufficient amount of moisture in dry places not to become indurated or yielding too readily to dampness."

Claim.—"What I claim is, the use of sal ammoniac as an ingredient of my soap, in combination with the other ingredients, the effect of which is to retain a sufficient amount of moisture to prevent drying up, and at the same time not enough to cause it to become damp by exposure to damp air."

6. For an *Improved Valve Arrangement for Steam Hammers;* James Watt, South Boston, Massachusetts.

Claim.—"What I claim is, 1st, The revolving valve rod, the barrel, and the adjustable screw stop, constructed, arranged, and operating in the manner substantially as described, by which I am enabled at any instant, to admit the steam beneath the piston during any portion of the fall of the hammer, without altering the effective force and length of the stroke. 2d, I claim, in connexion with the above, the arrangement for throttling the steam on its way from beneath the piston, by which means I am enabled to regulate the intensity of the blow of the hammer to any degree of nicety, or to hold the same suspended above the anvil, in the manner and for the purpose substantially as set forth."

7. For an *Improvement for Cleaning Machine Cards;* George Wellman, Powell, Mass.

Claim.—"What I claim is, in combination with a series of top cards of a carding engine, not only a mechanism for raising one or more of such top cards and holding the same upwards, and afterwards depressing the same back into place, but a mechanism for acting on and cleansing such top card or cards, when or while so elevated, not meaning in the above to claim either the mechanism for moving the top card or cards, or that for cleansing it or them, in their separate combination with the series of top cards, but to lay claim to both in their joint combination, and with the series of top cards, substantially in the manner described. And, in combination with the series of top cards and mechanism for raising and cleansing a top card and restoring it to its seat, I claim the mechanism for moving the raising and cleansing mechanism in succession, from one top card to the other, and whether from one card to the next one throughout the series, or from one to another of them to the next but one, or in any other order, substantially as specified. And I claim the combination of the grooved block, (or the grooves and circular arcs,) the arm with its stud, or the equivalent of said arm and stud, and the notched wheel, as applied to the shafts, and made to operate together, substantially as specified."

8. For an *Improvement in Overshot Water Wheels;* John E. Whitmore, Joliet, Ill.

Claim.—"What I claim is, the construction of the buckets with the covers, operating substantially in the manner and for the purposes specified. Also, the levers, springs, and bolt rods, as described, in combination with the cams, or their equivalents, for closing and opening the buckets, substantially in the manner and for the purposes fully set forth."

9. For an *Improved Mode of Ringing Fixed Bells;* Alfred Carson, City of New York; ante-dated June 6, 1853.

"By my improvement, the nature of which consists in the device for operating the usual

clapper hung at or near the centre of vibration of the bell, by means of a lever that turns on a centre below, and connected with the arm of the clapper by means of a slotted swivel near the upper part thereof, I am enabled to produce the maximum amount of vibration, and in the direction best calculated to impart to the surrounding air the full effect of the vibrations, the clapper being as usual hung at or near the centre of vibration of the bell, and giving its blows inside to communicate to the air outside the first effect of the blows."

Claim.—"I am aware that stationary bells have been rung from the inside, by vibrating the clapper; this I do not claim; but what I do claim is, the device herein described, as applied to the working of the clapper of a bell hung in the usual manner, as set forth."

10. For an *Improvement in Replacing Cars upon Railroad Tracks;* Lucian B. Flanders, Dunkirk, New York.

"The nature of my invention consists in replacing railroad cars and locomotives upon the track, by means of two flanches with inclined bottoms; said flanches being fitted to the rails, and one of the flanches being provided with a movable guide, which, as the car is moved forward and up the inclined flanches, guides the truck to its proper position upon the rails."

Claim.—"What I claim is, replacing railroad cars and locomotives upon the track, or replacing the car wheels upon the rails, in the manner substantially as herein described, viz: by means of flanches having inclined bottoms, and secured or attached to the rails when designed to be used, by the lips or projections on the sides of the flanches; said lips or projections clasping or fitting over the rails; the flanch being provided with a movable guide, which directs or guides the wheels upon the rails, and which guide, by being movable, will act upon the wheels, the flanch being adjusted to either side of the rails."

11. For an *Improvement in Illuminated Clocks;* James Glenn, City of New York.

"The nature of my invention consists in making two circular brass plates, having the figures of time cut through them, one plate having the hour figures only, cut in Roman characters, the other plate having the minute figures only, cut in Arabic characters, both of which are made to revolve by clock-work between the light of a lamp, or gas light, and two magnifying lenses, which throw the images of two divisions of the minute figures, and one division of the hour figures, on a screen or plate of ground glass in front; the figures are thus represented in light, and are seen more distinctly than by any other method at present in use."

Claim.—"What I claim is, the construction of two circular dial plates, having the figures of time cut through them in such a manner, which, being made to revolve by means of clock work, and by means of a light and two magnifying lenses, the time is represented on a plate of ground glass in front in white light, which may be perceived to a greater distance, and more distinctly, than by any other method at present in use, whether used with or without a magnifying lens."

12. For an *Improvement in Shower Syringes;* Ira Warren, Boston, Massachusetts.

Claim.—"What I claim is, a new and useful surgical instrument for the treatment of diseases of the air passages of the throat and nose, is the above syringe, constructed of the form and of the materials described, for the objects set forth."

13. For *Improvements in Cutters for Planing Mouldings;* R. M. Evans, Guilford, New Hampshire, Assignor to himself and Asa Weeks, South Boston, Massachusetts.

Claim.—"I do not claim making the cutters of shapes suited to the different parts of the article to be turned, either straight or curved, and securing them to a cutter wheel; but what I do claim is, making the cutting irons of moulding planes or turning tools of thin sections, in the manner described, which, after being set to a pattern and confined in clamps, may be brought to an exact edge by filing or grinding, in the manner and for the purpose substantially as set forth."

14. For an *Improvement in Condensers for Stills;* Carl E. Werner, New Castle, Ill.

Claim.—"What I claim is, the construction of the condenser, consisting of an outer upright cylinder with its upper chine projecting above the head, so as to form a circular trough, and an inner refrigerating cylinder, traversed by vertical tubes, which connect the vapor spaces above and below, the whole being situated above, and discharging the condensed fluid back into the rectifier."

MECHANICS, PHYSICS, AND CHEMISTRY.

Description of some New Kinds of Galvanic Batteries. Invented by Mr. Kukla, of Vienna.*

The combination used in one of these, is antimony, or some of its alloys, for a negative plate, with nitric acid of specific gravity 1·4, in contact with it, and unamalgamated zinc, for a positive plate, with a saturated solution of common salt in contact with it. A small quantity of finely powdered per-oxide of manganese is put into the nitric acid, which is said to increase the constancy of the battery. The alloys of antimony which Mr. Kukla has experimented with successfully are the following:—Phosphorus and antimony, chromium and antimony, arsenic and antimony, boron and antimony. These are in the order of their negative character, phosphorus and antimony being the most negative. Antimony itself is less negative than any of these alloys. The alloys are made in the proportions of the atomic weights of the substances. All these arrangements are said by Mr. Kukla to be more powerful than when platinum or carbon is substituted for antimony or its alloys. In this battery a gutta percha bell cover is used over the antimony, and resting on a flat ring floating on the top of the zinc solution,—this effectually prevents any smell, and keeps the per-oxide of nitrogen in contact with the nitric acid solution. When a battery of twenty-four cells was used, Mr. Kukla found that in the third and twenty-first cells pure ammonia in solution was the ultimate result of the action of the battery; but only water in all the others. This experiment was tried repeatedly, and always with the same result. A battery was put into action for twenty-four hours,—at the end of that time the nitric acid had lost thirteen-twentieths of an ounce of oxygen, and one-quarter of an ounce of zinc was consumed. Now as one-quarter of an ounce of zinc requires only 0·06 of an ounce of oxygen to form oxide of zinc, Mr. Kukla draws the conclusion, that the rest of the oxygen is converted directly into electricity; and this view, he says, is confirmed by the large amount of electricity given out by the battery in proportion to the zinc consumed in a given time. In the above battery each zinc plate had a surface of forty square inches. The addition of per-oxide of manganese does not increase the effect of the battery, but it makes it more lasting—the per-oxide of nitrogen, formed in the bell cover, taking one atom of oxygen from the per-oxide of manganese;—this is evident from only the oxide of manganese being found in the battery after a time: in the salt solution no other alteration takes place than what is caused by the oxide of zinc remaining in a partly dissolved state in the solution. For this batterry Mr. Kukla much prefers porous cells, or diaphragms of biscuit ware, as less liable to break, and being more homogeneous in their material than any other kind. This battery is very cheap, antimony being only 5*d.* per lb., wholesale, and the zinc not requiring amalgamation.—The second arrangement tried by Mr. Kukla was antimony and amalgamated zinc with only one exciting solution, viz. concentrated sulphuric acid:—this battery has great heating power, and the former great magnetizing power:—it, however, rapidly decreases in power, and is not so practically useful as the double fluid battery, which

* From the London Athenæum, October, 1853.

will exert about the same power for fourteen days, when the poles are only occasionally connected as in electric telegraphs. Certain peculiarities respecting the ratio of intensity to quantity when a series of cells is used, have been observed, which differ from those remarked in other batteries.—Mr. Kukla, on directing his attention to the best means of making a small portable battery for physiological purposes, has found very small and flat Cruikshank batteries, excited by weak phosphoric acid (one of glacial phosphoric acid to twenty of water), to be the best. phosphoric acid being very deliquescent, and forming with the zinc; during the galvanic action, an acid phosphate of zinc. A battery of this description does not decrease in power very materially until it has been three hours in action.

On the Elasticity of Stone and Crystalline Bodies. By E. Hodgkinson.*

It is generally assumed by writers on the strength of materials, that the elasticity of bodies is perfect, so long as the material is not strained beyond a certain degree. But from the experiments I made several years ago, at the instance of the British Association, on the strength of hot and cold blast iron (vol. vi.), I was led to conclude that the assumption was very incorrect, as applied to cast iron at least; and further experiments rendered it probable that it was only an approximation in any. Among the bodies of most value in the arts, cast iron holds an important place; and I found that bars of that metal, when bent with forces, however small, never regained their first form, after the force was removed; and this defect of its elasticity took place whether the cast iron was strained by tension, compression, or transverse flexure. I subsequently found that in the first two strains (by tension and compression), the straining force might be well represented by a function composed of the first and second powers of the change of length produced,—thus,

$$w = ae - be^2$$
$$w = a'c - b'c^2$$

where w is the weight applied, e the extension, c the compression, and a, a', b, b' constant quantities. If the elasticity were perfect, the part depending on the second power must be neglected. The necessity of a change in the fundamental assumptions for calculating the strength of materials may be inferred from the fact, that in computing the breaking weight by *tension*, from experiments on *transverse* flexure and fracture, we obtain the strength of cast iron three times as great as from numerous experiments I have found it to be. The formulæ of Tredgold give this erroneous result, and those of Navier are in accordance with them.

Stone.—To obtain the elasticity of stone, I had masses of soft stone, obtained from various places, sawn up into broad thin slabs, 7 feet long, and about 1 inch thick. They were rubbed smooth, and rendered perfectly dry in a stove, and were bent transversely in their least direction by forces acting horizontally. The slabs, during the experiments, were placed with their broad side vertical, and had their ends supported, 6 feet 6 inches asunder, by friction rollers, acting horizontally and vertically. It resulted from the experiments (as shown in a former volume of this Association), that the defects of elasticity were nearly as the square of the

* From the London Athenæum, October, 1853.

weight laid on; or consequently, as the square of the deflexion nearly, as in cast iron. The ribs never regained their first form after the weight was removed, however small that weight had been. From other ribs of stone, obtained from various localities, and broke transversely by weights, acting vertically, and increased to the time of fracture, the ratio of the deflexion to the weights applied were found in various experiments to be nearly as below:—

·02	·01	·02	·018	·02	.027
·035	·012	·022	.023	·022	·032
·05	·0125	·033	.024	·024	·035
·07	·014	·036	·027	·025	·038
·09	·015			·026	
·11	·016				

The ratio represented by the numbers in each vertical column, are those in each separate rib of stone; and they would have been equal if the elasticity had continued perfect, but they were increasing where the weights were increased in every instance. The change shown by these experiments to be necessary would increase considerably the mathematical difficulties of the subject; and they would be greater still, if the change of bulk and lateral dimensions in the bodies strained were included, according to the conclusions of Poisson, or the experiments of Wertheim, which are at variance with each other. But these changes are so small in the bodies I am contemplating, that they may be neglected for all practical purposes. Thus, from my experiments, the utmost extension of a bar of cast iron, 50 feet long, is about 1 inch, or $\frac{1}{600}$th of the length, and therefore the change of lateral dimensions of the bar being only a fraction of this $\frac{1}{600}$th, according either to Poisson or Wertheim, it is too small to need including. The experiments in which I deduced the utmost extension of cast iron, are given in the 'Report of the Commissioners on the Strength of Iron for Railway Purposes.' If the body strained were wrought iron, brass, or others of a very ductile nature, the change of lateral dimensions might, in extreme cases, be included. I beg to mention, with great deference, that the profound work of Lamé, lately published on 'The Mathematical Theory of Elasticity,' in which the elasticity is considered as perfect only, does not appear to apply to such bodies as I have here treated of.

Report on the Gases evolved in Steeping Flax, and on the Composition and Economy of the Flax Plant. By Prof. Hodges.*

The investigations directed by the Association, at the Belfast Meeting, with respect to the gases evolved in the steeping of flax and the composition of flax straw are in progress, and will be reported at the next meeting. The gases of the fermenting vat have been analyzed by the methods of Prof. Bunsen, and have been found to consist of carbonic acid, hydrogen and nitrogen. No sulphuretted hydrogen has, in any case, been detected. Several analyses of the proximate constituents of the dress fibre and of its inorganic ingredients have been made, which show that a considerable amount of the nitrogenized and other constituents of the plant are retained in the fibre even after steeping and dressing have removed the structures unsuitable for textile purposes.

* From the London Athenæum, October, 1853.

For the Journal of the Franklin Institute.

The Transatlantic Steamship Franklin, trading between New York and Havre. By B. F. Isherwood, Chief Eng., U. S. N.

By the kindness of Mr. L. S. Bartholomew, I have become possessed of the steam logs of the *Franklin* for the voyages during which he was Chief Engineer of that vessel. Taken in connexion with exact dimensions of the hull, machinery, &c., these authentic logs, with the results deducible from them, will be of interest to the marine engineer.

The following are the dimensions of the hull and machinery:

Hull.

Length on deck,	263 feet.
Breadth of Beam,	41 " 10 in.
Depth of hold,	26 "
Mean load draft of water on leaving port,	19 " 5 in.
" draft of water on arriving in port,	16 " 3 "
" " " for the voyage,	17 " 10 "
Immersed amidship section, at 17 feet 10 inches draft of water,	609 square feet.
Displacement per inch at 17 feet 10 inches draft of water,	17 tons.

Engines.—Two side lever engines, with balanced poppet valves.

Diameter of cylinders,	93 inches.
Stroke of pistons,	8 feet.
Space displacement of both pistons per stroke,	754·768 cubic feet.

The steam was cut off in the cylinder with the steam induction valve by Stillman and Allen's arrangement. The engines, boilers, &c., were designed and constructed at the Novelty Works, New York.

Boilers.—Four in number, of the double return drop kind, placed in pairs, back to back, with one smoke chimney in common. The boilers are of iron, with circular shells the entire length.

Diameter of each boiler,	12 feet 9 in.
Length of "	22 "
Number of furnaces in each boiler,	3.
Total area of heating surface in the four boilers,	8528 sq. feet.
Length of the fire grates,	7 feet.
Total area of grate surface in the four boilers,	300 sq. feet.
Aggregate cross area of the two first, or upper rows of flues,	57 " "
" " " " middle rows of flues,	46 " "
" " " " lower rows "	43⅓ " "
Distance traversed by the heated gases, from the centre of the furnaces, to their delivery into the chimney,	41½ feet.
Average diameter of the flues,	1·216 "
Cross area of the smoke chimney,	50 sq. feet.
Height of the smoke chimney above the grates,	63 feet.

Proportions.

Proportion of heating to grate surface,	28·427 to 1·000
" grate surface to cross area of two upper rows of flues,	5·263 "
" " " " " middle "	6·522 "
" " " " " lower "	6·923 "
" " " " the smoke chimney,	6·000 "
Length of the distance traversed by the heated gases in proportion to the diameter of the flues,	34⅛ to 1·

Paddle Wheels—Of the common radial kind.

Diameter from outside to outside of paddles,	32 feet 2 in.
Number of paddles in each wheel,	28
Length of each paddle,	11 feet 8 in.
Width " "	2 "
Area of two paddles,	46⅔ sq. feet.
Immersion of the lower edge of paddles at 17 feet 10 in. draft,	6 feet 8 in.
Number of paddles in water " " "	8 1-6
Area of all immersed paddles " " "	190·55 sq. feet.
Distance from centre to centre of paddles measured on periphery,	3·6 feet.

Eleventh Voyage from New York to Havre.

1852. DATE.	Av. steam press. in boils. in lbs. pr sq. in. ab. atm.	Total number of revolutions of the wheels, taken by counter.	Pounds of coal consumed.	Distance run in geographical miles by observation.	Steam cut off at in steam cylinders from com. of stroke of pistons in feet.	Latitude.	Longitude.	Running time in hours and minutes.	Wind.	Sail.	Sea.
May 8	14·7	19826	1157?0	250	2·1	40° 35′	69° 06′	23 39	Light, for'd. beam.	Fore and aft.	Smooth.
" 9	16·0	19666	1182?0	240	2·1	—	—	23 43	" "	"	"
" 10	15·5	18310	1143?0	244	2·1	—	—	23 36	" "	"	"
" 11	16·0	19920	1135?0	255	2·1	43 28	52 13	23 35	" "	"	"
" 12	16·0	20420	1266?5	283	2·1	45 18	46 36	23 37	Light wind ahead.	None.	Very smth.
" 13	16·0	20473	1191?9	234	2·1	47 10	40 19	23 35	Mod. wind abeam.	All sail.	Moderate.
" 14	13·5	19667	1187?4	282	2·6	48 25	33 33	23 33	Strong wind ab'm.	"	Rough.
" 15	12·0	19486	1118?2	279	2·6	48 39	26 36	23 32	" "	"	"
" 16	15·0	20132	1170?6	291	2·1	49 25	19 16	23 31	" "	"	"
" 17	15·0	22087	1183?0	302	2·1	49 54	11 34	23 29	" "	"	"
" 18	15·0	22433	1152?0	291	2·5	—	—	23 38	" "	"	"
" 19	16·3	20306	1075?0	280	2·1	—	—	22 06	" "	None.	Smooth.
Totals		242739	1396330	3261				281 28			
Means	15·1	14·373 pr. mn	4961 pr hour.	11·586 pr hr.	2·22						

Eleventh Voyage from Havre to New York.

June 8	17·0	7347	58?00	90	2·1	—	—	10 30	Light head wind.	No sail.	Smooth.
" 9	17·0	16003	89?50	224	2·1	50 00	6 50	24 05	" "	"	"
" 10	16·0	20008	110?00	273	2·1	50 32	13 53	24 28	Light for'd beam.	Fore and aft.	"
" 11	16·7	20568	103?20	273	2·1	50 44	20 50	24 28	" "	"	"
" 12	17·5	18097	109?25	205	2·1	50 45	26 14	24 22	" "	"	Moderate.
" 13	16·8	16264	99?25	183	2·1	50 46	31 05	24 19	Strong head wind.	No sail.	Heavy.
" 14	16·3	17927	103?30	179	2·1	49 26	35 19	24 17	" "	"	"
" 15	16·0	18613	121?80	211	2·1	48 27	40 28	24 21	" "	"	Rough.
" 16	15·5	21956	103?90	280	2·1	47 23	47 13	24 27	Mod. for'd. beam.	Fore and aft.	Moderate.
" 17	16·0	22629	107?70	292	2·1	46 27	54 13	24 28	Light head wind.	No sail.	Smooth.
" 18	15·5	23126	103?10	290	2·1	44 45	60 27	24 25	{ Light aft. 12 hs. { Light head wind.	{ Sail 12 hs. { No sail.	"
" 19	15·3	23230	106?90	280	2·1	—	—	24 25	" "	No sail.	"
" 20	14·3	22436	94?10	209	2·1	40 40	72 20	23 50	Light for'd. beam.	Fore and aft.	"
" 21	14·0	7576	32?40	109	2·1	—	—	8 00	" "	"	"
Totals		256386	1340?16	3189				310 25			
Means	16·0	13·766 pr mn	4319 per hr.	10·273 pr hr.	2·10						

Twelfth Voyage from New York to Havre.

July 3	15·[illegible]	18077	102?07	255	2·2	40 50	68 59	23 00	Mod. wind abeam.	All sail.	Smooth.
" 4	16·0	19838	97?80	259	2·3	42 44	63 37	23 39	Light wind aft.	"	"
" 5	17·[illegible]	20098	109?20	261	2·3	44 58	58 27	23 39	Light wind abeam.	"	"
" 6	17·[illegible]	20688	107?40	272	2·4	46 36	52 22	23 36	Light wind ahead.	None.	"
" 7	17·[illegible]	21330	118?60	280	2·4	48 21	45 58	23 34	Light wind abeam.	All sail.	"
" 8	16·[illegible]	21463	112?90	302	2·3	49 38	38 34	23 30	" " "	"	"
" 9	17·[illegible]	21393	115?50	286	2·3	50 40	31 14	23 31	Light for'd. beam.	Fore and aft.	"
" 10	16·[illegible]	21492	110?50	294	2·3	50 49	23 32	23 29	Light breeze aft.	All sail.	Moderate.
" 11	16·[illegible]	21406	104?00	287	2·3	50 45	16 02	23 30	Mod. wind abeam.	"	"
" 12	16·[illegible]	23443	118?80	289	2·1	50 07	8 30	23 30	Light wind ahead.	None.	Smooth.
" 13	16·[illegible]	24156	109?00	289	2·1	—	—	23 00	" " "	"	"
Totals		233384	1213?87	3074				257 58			
Means	16·6	15·079 pr mn.	4704 pr hour.	11·916 pr hr.	2·28						

Twelfth Voyage from Havre to New York.

DATE. 1852.	Av. steam press. in bells in lbs. pr sq. in. ab atm	Total number of revolutions of the wheels, taken by counter.	Pounds of coal consumed.	Distance run in geographical miles by observation.	Steam cut off at in steam cylinders from com. of stroke of pistons in feet.	Latitude.	Longitude.	Running time in hours and minutes.	Wind.	Sail.	Sea.
Aug. 4	17·0	17916	111360	225	2·5	—	—	24 26	Fresh br. for'd. bm.	Fore and aft.	Moderate.
" 5	15·5	17824	119040	225	3·2	50 31	10 25	24 26	Strong wd. fo'd. bm.	"	Rough.
" 6	15·3	17140	111600	207	3·5	50 15	15 47	24 22	Strong wind ahead.	None.	"
" 7	15·0	17584	111780	193	3·6	50 14	20 47	24 20	" "	"	Heavy.
" 8	15·3	19793	110700	232	2·9	49 44	26 46	24 24	" "	"	"
" 9	15·5	21184	109940	282	2·4	49 07	33 52	24 28	Mod. for'd beam.	Fore and aft.	Moderate.
" 10	15·3	22192	113160	292	2·6	48 53	41 17	24 30	Light wind abeam.	All sail.	"
" 11	15·3	21778	110450	260	2·6	48 00	47 30	24 25	Light wind ahead.	None.	"
" 12	16·0	22080	113160	296	2·5	46 03	54 09	24 27	Mod. wind abeam.	All sail.	"
" 13	16·3	23940	119850	286	2·5	44 43	60 41	24 26	Light wind ahead.	None.	"
" 14	16·5	24388	113850	296	2·6	42 00	66 19	24 22	" "	"	Smooth.
" 15	16·0	24528	113620	296	2·4	40 24	72 19	24 24	" "	"	"
" 16	16·0	6813	24840	74	2·4	—	—	6 00	" "	"	"
Totals		257760	1383350	3164				299 00			
Means	15·8	14·370 pr mn.	4627 pr hour.	10·582 pr. hr.	2·77						

Thirteenth Voyage from New York to Havre.

Au. 28	16·0	17416	112220	232	2·5	40 35	69 29	22 56	Light for'd. beam.	Fore and aft.	Moderate.
" 29	16·0	18542	112220	262	2·4	42 40	64 25	23 46	" "	"	"
" 30	16·0	16700	110400	245	2·3	44 38	60 13	23 43	" "	"	"
" 31	16·0	18965	120520	250	2·2	45 20	56 06	23 44	" "	"	"
Sept. 1	15·8	19706	119140	269	2·0	47 12	48 28	23 20	Light wind for'd. beam. 8 hs. calm.	Fore & aft. S hs. No sail.	Smooth.
" 2	16·0	20505	117000	225	2·2	48 23	43 13	23 40	Light for'd. beam.	Fore and aft.	Moderate.
" 3	16·0	19375	117300	272	2·3	49 17	36 28	23 33	Strong for'd. beam.	"	Rough.
" 4	16·0	21851	119140	288	2·0	50 21	29 14	23 31	Mod. wind abeam.	All sail.	Moderate.
" 5	16·0	21338	113280	286	2·1	50 30	21 10	23 31	Light wind aft.	"	"
" 6	16·0	21972	125120	276	2·1	54 35	14 19	23 32	Light for'd. beam.	Fore and aft.	"
" 7	16·0	22436	120600	281	2·1	49 34	7 26	23 32	" "	"	Smooth.
" 8	16·0	22589	121050	280	2·1	—	—	22 59	" "	"	"
" 9	16·4	7327	36960	90	2·1	—	—	7 15	" "	"	"
Totals		248722	1444950	3236				288 50			
Means	15·6	14·352 pr mn.	5003 pr. hour.	11·203 pr. hr.	2·19						

Thirteenth Voyage from Havre to New York.

Sep 28	15·0	1203	21190	11	2·5	—	—	1 45	Strong w'd. abeam.	None.	Moderate.
" 29	15·0	17512	110530	151	2·9	49 56	4 45	24 18	Fresh for'd. beam.	Fore and aft.	"
" 30	15·3	19511	111320	255	2·8	50 29	11 26	24 27	Mod. wind ahead.	None.	Smooth.
Oct. 1	15·5	19179	113080	288	3·1	50 30	18 08	24 27	Mod. for'd. beam.	Fore and aft.	Rough.
" 2	15·8	19097	112640	261	2·7	—	—	24 26	" "	"	Moderate.
" 3	16·0	18446	114840	217	3·1	50 08	30 33	24 23	Strong for'd. beam.	"	Rough.
" 4	16·0	20265	115720	247	2·5	49 28	36 51	24 25	Light abm. 16 hs. Strong head w'd.	Sail for 16 hs. No sail.	Moderate.
" 5	15·8	21694	113320	271	2·4	48 41	43 37	24 27	Light for'd. beam.	Fore and aft.	"
" 6	15·7	22291	117040	280	2·6	47 24	50 31	24 28	Mod. wind abeam.	All sail.	"
" 7	15·5	22026	121951	279	2·4	45 40	56 47	24 25	Calm.	None.	Smooth.
" 8	16·0	23891	123300	294	2·6	43 19	62 59	24 25	Light for'd. beam.	Fore and aft.	"
" 9	15·5	24067	125550	302	2·4	40 47	68 52	24 24	" "	"	"
" 10	15·2	19991	103950	285	2·1	—	—	21 00	" "	"	"
Totals		249170	1404421	3151				291 20			
Means	15·6	14·255 pr mn.	4827 pr. hour.	10·816 pr. hr.	2·63						

SUMMARY OF THE STEAM LOGS OF THE FRANKLIN.

From New York to Havre.

Voyage.	TOTALS. Length of voyage in hours and minutes.	Length of voyage in geographical miles, by observation.	No. of revolutions made by the wheels during the voyage, by counter.	Amount of coal consumed during the voyage, in tons and pounds.	MEANS. Average steam press. in boils. in lbs. per sq. in. above atmosphere.	Steam cut off at in cylinders from com. of stroke of pistons in feet.	Number of revolutions of the wheels made per minute.	Speed of the vessel in geographical miles per hour.	Consumption of coal in pounds per hour.	Consumption of coal per 24 hours in tons and pounds.	Slip of the paddle wheel in per centums of its speed.	Horses power developed by the engines.	Mean effective pressure on pistons throughout stroke, in pounds per square in.
11th.	281 28	3261	242739	623 810	15·1	2·22	14·373	11·586	4961	53 344	15·30	1342·16	14·17
12th.	257 58	3074	233384	541 1547	16·6	2·28	15·079	11·916	4704	50 896	16·96	1528·61	15·39
13th.	288 50	3236	248722	645 250	15·6	2·19	14·352	11·203	5003	53 1352	17·97	1344·32	14·22
Totals	828 16	9571	724845	1810 367									
Means					15·7	2·23	14·586	11·555	4895	52 1000	16·75	1390·90	14·57
From Havre to New York.													
11th.	310 25	3189	256386	598 1196	16·0	2·10	13·766	10·273	4319	46 616	21·58	1286·74	14·19
12th.	299 00	3164	257760	617 1270	15·8	2·77	14·370	10·582	4627	49 1288	22·60	1587·39	16·77
13th.	291 20	3151	249170	626 2191	15·6	2·63	14·255	10·816	4827	51 1608	20·27	1536·18	16·36
Totals	900 45	9504	763316	1843 177									
Means					15·8	2·50	14·124	10·551	4583	49 232	21·50	1465·29	15·75

Remarks on the Steam Logs.—The throttle valve was carried wide open, and the general correspondence of a great number of indicator diagrams shows the steam pressure in the cylinders to have been 3½ lbs. less than in the boilers; the lift of the valves, and consequently the opening, is considerably reduced when cutting off from ¼ to ⅓. From the same source it also appears, that the mean effective pressure on the pistons throughout the stroke was 1·8 lbs. per square inch greater than what was due to the theoretical expansion curve; this 1·8 pounds includes the effect of the steam in the nozzles and clearances of the cylinders, and of the leakages of the steam valves, &c. The vacuum in the condensers per gauge was 25 inches of mercury, and the back pressure in the pistons 4·2 lbs. per square inch.

The temperature of the feed water was maintained at 120° Fah. The fuel was burned with the natural draft.

The distances run were determined by observation from meridian to meridian, and the length of the geographical mile on the 45th degree of latitude is taken from Frome at 6115·8 feet.

The easterly voyages are all between New York and Havre, except the twelfth, which is from New York to Cowes. The return voyages are all from Havre to New York.

By observing the *Summary*, it will be perceived that the weather was much more favorable during the voyages *from New York to Havre*, than on the return; the mean speed in the former being 11·555 miles per hour, and in the latter 10·551 miles per hour, or 9·51 per centum of the latter less. The mean slip of the centre of pressure of the paddles in the voyages *from New York to Havre*, was 16·75 per centum of its speed, while

in the return voyages it was 21·50 per centum, or 28·36 per centum of the latter more. The less resistance on the voyages *from New York to Havre* than on the return, is also shown by the greater mean effective steam pressure on the pistons required during the latter, to produce an equal number of revolutions of the wheels in a given time. All the voyages given in the logs were made under very favorable circumstances of wind and sea.

The quantity of coal carried was 950 tons, and the average consumption per voyage 609 tons, leaving an overplus for extraordinarily unfavorable weather of 341 tons, or about 6¾ days' additional steaming; the whole amount of fuel carried being sufficient for nearly 19 days' steaming.

The consumption of the engineer's stores for each 24 hours' steaming was as follows, viz: oil, 7½ gallons; tallow, 15½ lbs.; wiping stuff, 6 lbs.

On the voyages *from New York to Havre*, sail was set for 696 hours 4 minutes out of the 828 hours 16 minutes, or for 84 per centum of the time. On the voyages *from Havre to New York*, sail was set for 495 hours ten minutes out of the 900 hours 45 minutes, or for 55 per centum of the time.

Evaporation by the Boilers.—The fuel consumed on the voyages *from New York to Havre*, was Cumberland bituminous coal; that consumed on the return voyages, *from Havre to New York*, was the English bituminous coal, almost identical in its chemical constitution, and giving sensibly the same evaporation.

In calculating the evaporation, the steam pressure in the cylinders before cutting off and at the point of cutting off, are determined from a large number of indicator diagrams. The number of double strokes of pistons made was taken from the counter. The temperature of the feed water was carried by thermometer at 120° Fah.; and the weight of coal consumed was ascertained for each watch of four hours by measurement in a large tub, verified at the close of the voyage by a comparison of the remainder with the amount taken in. Regnault's determination of the total heat of steam is used, and the evaporation includes the waste steam (40 cubic feet in one end of both cylinders) in the cylinder nozzles, clearance, &c., and also the loss by *blowing-off*, to maintain the sea water in the boilers at 1¾ the natural concentration.

Evaporation by the Cumberland Bituminous Coal.—For this calculation we have the following DATA, viz:—

Length of time consuming the coal,	828 hours 16 minutes.
Quantity of coal consumed, (tons, 2240 pounds,)	1810 tons 367 pounds.
Number of double strokes of pistons made,	724,845
Steam pressure in cylinders per square inch above atmosphere before cutting off,	12·2 pounds.
Steam cut off at in cylinders from commencement of stroke,	2·23 feet.

From which we obtain the following RESULTS, viz:—

Cubic feet of steam of atmospheric pressure furnished per minute,	14,884·940
Pounds of steam evaporated per hour by one square foot of heating surface,	3·850
Pounds of steam evaporated per hour, by one pound of coal,	6·707
" coal consumed per hour per square foot of heating surface,	0·574
" " " " " " grate "	16·317

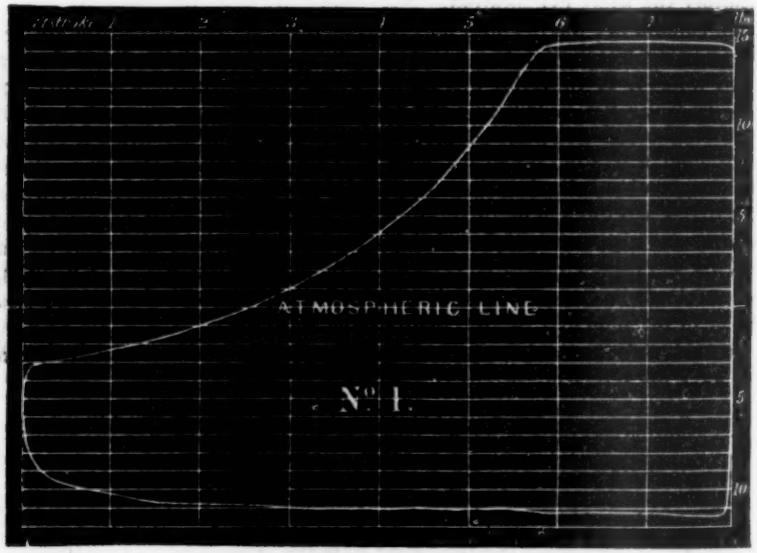
Evaporation by the English Bituminous Coal.—For this calculation we have the following DATA, viz:—

Length of time consuming the coal,	900 hours 45 minutes.
Quantity of coal consumed, (tons, 2240 pounds,)	1843 tons 177 pounds.
Number of double strokes of pistons made,	763,316
Steam pressure in cylinders, per square inch above atmosphere, before cutting off,	12·3 pounds.
Steam cut off at in cylinders from commencement of stroke,	2·50 feet.

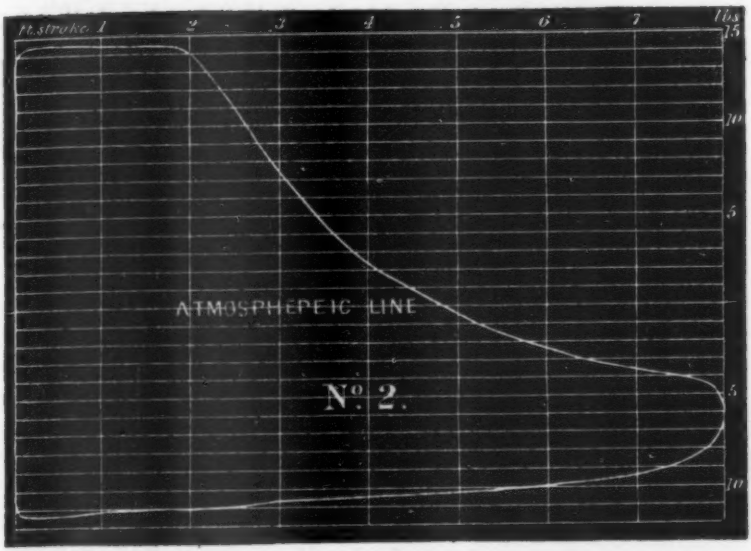
From which we obtain the following RESULTS, viz:—

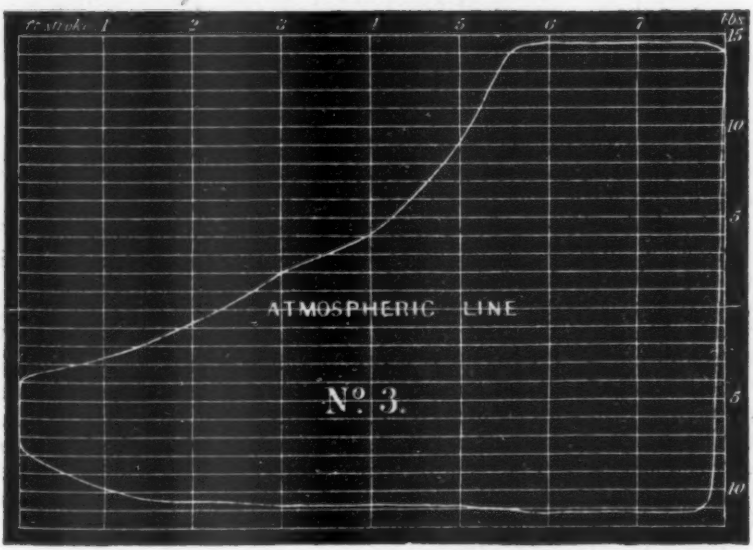
Cubic feet of steam of atmospheric pressure furnished per minute,	15,879·387
Pounds of steam evaporated per hour, by one square foot of heating surface,	4·107
Pounds of steam evaporated per hour by one pound of coal,	6·885
" coal consumed per hour, per square foot of heating surface,	0·538
" " " " " " grate "	15·277

Indicator Diagrams.—The diagrams numbered 1, 2, 3, and 4, were taken from the steam cylinders with the throttles wide open, and serve to show the manner of using the steam under the ordinary conditions of practice. No. 1 was taken from the upper end of the port cylinder; No. 2 was taken from the lower end of the port cylinder; No. 3 was taken from the upper end of the starboard cylinder; No. 4 was taken from the lower end of the starboard cylinder. The steam pressure in the boiler above atmosphere was 18 pounds per square inch, and the number of

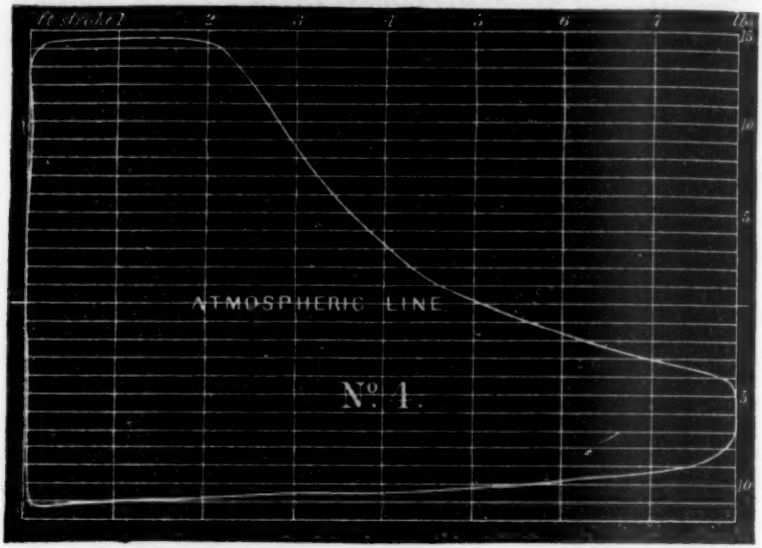


double strokes of piston made per minute 14. The vacuum in the condensers per gauge was 25 inches of mercury; temperature of the feed water 120° Fah. The steam pressure in the cylinders before cutting off is 3½ pounds per square inch less than the boiler pressure, and the mean back pressure (4·2 pounds per square inch) against the pistons is 2 lbs. per square inch more than the back pressure in the condensers. The


ATMOSPHEPEIC LINE
No. 2.


ATMOSPHERIC LINE
No. 3.

mean effective pressures throughout the stroke per square inch of pistons are as follows, viz: No. 1, 16·6 lbs.; No. 2, 15·0 lbs.; No. 3, 16.7 lbs.;



No. 4, 15·3 lbs.; mean of the four, 15·9 lbs. The horse power developed by the engines under the above conditions, the piston moving at the speed of 224 feet per minute, was 1466·28.

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*Chemistry and Perfumery.**

It will be remembered that Dr. Playfair, in his lecture "On the Chemical Principles involved in the Manufactures of the Great Exhibition," adverts to the fact, that "some of the most delicate perfumes were made by chemical artifice, and not, as of old, by distilling them from flowers." He goes on to state that perfumes thus prepared were sent to the Exhibition, and that "singularly enough they are generally derived from substances of an intensely disgusting odor. A peculiarly fœtid oil, termed 'fusel oil,' is formed in making brandy and whiskey." "Putrid cheese," a "soap made with butter," "the fœtid oils of gas-tar," and "the drainings of cowhouses," are those stated to be the main source to which the manufacturer applies for the production of his most delicate and admired perfumes. Professor Fehling, in the Wurtemburg *Journal of Industry*, gives an abstract of what is at present known respecting the composition of some of these artificial essences. The following is a description of these extracts, and of their manufacture:

Pine Apple Oil.—This product consists of a solution of 1 part of butyric acid ether, in 8 to 10 parts of spirits of wine. For preparing butyric acid ether, pure butyric acid is required, and this is obtained most readily and

* From the Journal of the Society of Arts, London, No. 27.

in greatest quantity, by the fermentation of sugar, or of St. John's bread (*siliqua dulcis*). For preparing butyric acid from sugar, M. Bentch takes a solution of 6 lbs. of sugar and half an ounce of tartaric acid in 26 lbs of water, which is left to stand for some days; at the same time about a quarter of a pound of old decayed cheese is diffused in 8 lbs. of sour milk, from which the cream has been removed; and after this has also stood for some days, it is mixed with the first solution, and the whole is kept from four to six weeks at a temperature of about 24° to 28° Reaumer, water being added from time to time to replace that which is lost by evaporation. After the evolution of gas has entirely ceased, the liquid is dissolved with its own bulk of water, and finally 8 lbs. of crystallized soda, dissolved in 12 lbs. to 16 lbs. of water, are added to it. The liquid is then filtered and evaporated till it weighs only 10 lbs., when a quantity of 5½ lbs. of sulphuric acid (*nordhausen*, or fuming sulphuric acid), diluted with 5½ lbs. of water, is carefully mixed with it by small portions at a time. The butyric acid, in the state of an oily substance, will now appear on the surface of the liquid, from which it may be skimmed off; but as the remaining liquid still contains some butyric acid, it is submitted to distillation, by which means another portion of diluted butyric acid is obtained, which may be concentrated by means of melted chloride of calcium, or by saturating it with carbonate of soda, evaporating and decomposing by sulphuric acid. By this method 1¾ lbs. of pure butyric acid are obtained from 6 lbs. of sugar.

M. Marsson says that the same product may be obtained from St. John's bread (*siliqua dulcis*), by taking 4 lbs. of mashed St. John's bread, and mixing it with 10 lbs. of water and 1 lb. of chalk; the liquid matter must be maintained from three to four weeks at a temperature of from 25° to 35° Reaumer, and be often and well stirred, and from time to time the water that has evaporated must be replaced. After fermentation has ceased, a quantity of water equal to the bulk of the liquid is added, and afterwards a concentrated solution of 2½ lbs. or 2¾ lbs. of carbonate of soda, when it is finally evaporated. To the concentrated liquid is then added 1½ lbs. to 2 lbs. of sulphuric acid, diluted with 2 lbs. of water; and the remainder of the process is performed as already described. By this method a little more than half a pound of colored butyric acid will be obtained. The acid, however, retains a peculiar smell from the St. John's bread, which continues even in the ether prepared from the same, whereas that prepared from sugar gives an ether of a very pure smell. It will be found advantageous to agitate the oily butyric acid with chloride of calcium, in order to deprive it entirely of its moisture.

For preparing butyric acid ether (butyrate of oxide of ethyle) from butyric acid, 1 lb. of butyric acid is dissolved in 1 lb. of rectified alcohol (95° Tralles), and is mixed with one-half to one-fourth of an ounce of concentrated sulphuric acid; the compound is heated for some minutes, when the butyric acid ether will form a thin layer on the top. The whole is then mixed with half of its bulk of water, and the upper layer taken off; the remaining liquid being submitted to distillation, yields another quantity of butyric acid ether, which is mixed with that obtained in the first instance, and the whole well agitated with a very diluted solution of soda, in order to deprive it of all the acid; which operation should be repeated several

times if a very pure ether is desired to be obtained. Care should be taken to use but small quantities of the diluted soda solution at a time, so as not to lose too much ether, this latter being in some measure soluble in water. When large quantities are to be acted upon, the washing water (*eau de lavage*) is collected, mixed with an equal volume of spirits of wine, and distilled, by which means a solution of pure butyric acid ether in spirits of wine is obtained.

Butyric acid ether may be also obtained immediately from butyric of soda by dissolving 1 part of this salt in 1 part of rectified alcohol, adding 1 part of sulphuric acid, and heating some minutes. The ether collects on the top of the liquid, and is purified by washing with water and with diluted soda solution.

For preparing pine-apple oil, 1 lb. of butyric acid ether is dissolved in 8 lbs. to 10 lbs. of spirits of wine, which should have been previously deprived of its empyreumatic or fusel oil. Pure French spirits of wine will be found best suited for this purpose. According to the purpose for which the pine-apple oil is to be applied, either rectified alcohol of 80° to 90° Tralles, or brandy of 40° to 50°, should be used for dissolving the ether. 20 drops to 25 drops of such an extract will suffice for giving a strong pine-apple odor to 1 lb. of sugar solution, to which some acid, such as tartaric or nitric acid, is generally added.

Bergamot Pear Oil.—What is called pear-oil is an alcoholic solution of acetate of oxide of amyle, and acetate of oxide of ethyle, prepared from potato fusel oil (the hydryte of oxide of amyle). The potato fusel oil, or oil of potato spirits (in German, *fuseloel*), is the compound distilled over towards the end of the first distillation of spirits made from potatoes, and is an oily liquid of a very strong and nauseous odor. This oil, in the state in which it is obtained from large potato brandy distilleries, is never pure; but it may be purified by agitating it with a diluted soda solution, when the pure fusel oil collects as an oily layer on the top of the liquid; this oily substance is then submitted to distillation, and that part which distils over at 100° to 112°, Reaumer, is collected, and forms the pure fusel oil.

For preparing acetate of oxide of amyle from this fusel oil, 1 lb. of pure ice vinegar is mixed with an equal quantity of fusel oil, to which is added half a pound of sulphuric acid; the liquid is digested for some hours at about 100°, when the acetate of oxide of amyle separates, particularly on being mixed with a small quantity of water. The remaining liquid, when mixed with more water, yields, on being submitted to distillation, a further quantity of acetate of oxide of amyle. The entire mass of oxide of amyle thus obtained is now agitated several times with water and a little soda solution, in order to deprive it of all free acid.

The acetate of oxide of amyle may also be obtained by taking 1 part of fusel oil to 1½ parts of dry acetate of soda, or 2 parts of acetate of potash, with 1 to 1½ parts of sulphuric acid. The liquid having been kept for some time at a gentle heat, the acetate of oxide of amyle is separated by adding water, and proceeding as above explained. 15 parts of acetate of oxide of amyle are mixed with 1½ parts of vinegar ether (vinegar naphtha, acetate of oxide ethyle), and dissolved in 100 to 120 parts of spirits of wine, as in the case of pine-apple extract; an acid—for instance,

tartaric or citric, should be added to the sugar solution, on making use of the pear extract, which addition makes the flavor of the bergamot pear better distinguishable, and the taste acquires at the same time more of the refreshing qualities of fruit.

Apple Oil.—What is called apple oil, is a solution of valerianate of oxide of amyle in spirits of wine, which may be obtained as a secondary product when fusel oil is distilled with chromate of potash and sulphuric acid for the preparation of valerianic acid. The light solution which collects in the tops of the distilled liquid contains valerianate of oxide of amyle, together with other liquids, such as adehyde, which gives to the product a less agreeable taste and smell. It is therefore to be preferred for preparing pure valerianate of oxide of amyle.

For preparing valerianic acid, 1 part of fusel oil is mixed by small portions with 3 parts of sulphuric acid, and afterwards 2 parts of water are added. At the same time, a solution of $2\frac{1}{4}$ parts of bichromate of potash in $4\frac{1}{2}$ parts of water is heated in a tubular retort; the first liquid is then permitted to flow very slowly into the liquid of the retort in such manner that the boiling continues but very slowly. The liquid which is distilled over is saturated with carbonate of soda, and is evaporated either to dryness for obtaining valerianate of soda, or to the consistency of syrup, when sulphuric acid is added (say 2 parts of concentrated acid diluted with the same quantity of water, for every 3 parts of crystalline carbonate of soda). The valerianic acid forms an oily layer on the upper part of the liquid, which latter will still yield some valerianic acid on being submitted to distillation. For preparing valerianate of oxide of amyle, 1 part by weight of pure fusel oil is mixed carefully with an equal quantity by weight of common English sulphuric acid; the resulting solution is added to $1\frac{1}{4}$ parts of oily valerianic acid, or to $1\frac{1}{2}$ parts of dry valerianate of soda, and is treated by a water-bath and then mixed with water, by which means the impure valerianate of the oxide of amyle will be separated; this is washed several times with water, afterwards with a solution of carbonate of soda, and finally again with water. In preparing this compound, it is essential that the mixture of sulphuric acid and fusel oil with valerianic acid should not be heated to a too high degree, or too long, as the product would thereby acquire an insufferably pungent smell when required for use. 1 part of valerianate of oxide of amyle is dissolved in 6 or 8 parts of spirits of wine, and acid is added in the same manner, as has been before explained in the preparation of other extracts.

Artificial Oil of Bitter Almonds.—When Mitscherlich, in 1834, discovered nitro-benzole, he little thought, after twenty years, to find this body in an industrial exhibition. He certainly, at that time, pointed out the remarkable resemblance which the odor of nitro-benzole had to that of bitter almonds; but the only sources for obtaining benzole at that time, viz., the oil of compressed gas, and the distillation of benzoic acid, were much too expensive, and put an end to the idea of substituting the use of nitro-benzole for oil of bitter almonds. Mansfield, however, in 1849, showed, by careful investigation, that benzole may be produced easily and in large quantities from oil of coal tar, and this discovery has not been lost sight of in the arts. Among the articles of French perfumery in the Great Exhibition, with the title of *artificial oil of bitter almonds,*

and the fanciful name of *essence of Mirbane*, there were several specimens of oils, which consisted of more or less pure nitro-benzole. The apparatus used in the preparation of this substance is that proposed by Mr. Mansfield. It consists of a large glass worm, the upper end of which branches into two tubes, which are provided with funnels. A stream of concentrated nitric acid flows slowly through one of these funnels, whilst the other is for the benzole (which for this purpose need not be absolutely pure). At the point at which the tubes of the funnels are united, the two bodies come in contact, the chemical compound formed becomes sufficiently cooled in passing through the worm, and only requires to be washed with water, and finally with some weak solution of carbonate of soda, to be ready for use. Although the nitro-benzole closely resembles oil of bitter almonds in physical properties, it possesses, however, a somewhat different odor, readily recognised by a practised person. However, it answers well for scenting soap, and would be extensively applicable for confectionary and for other culinary purposes. For the latter purpose it has the special advantage over oil of bitter almonds, that it contains no prussic acid.

The American Annual of Scientific Discovery, speaking on this subject, says, "The composition and artificial production of the various extracts of fruit and other similar perfumes and essences, strikingly illustrates the wonderful progress which has been made in organic chemistry within the last few years. A position has been taken by some chemists who have carefully investigated this subject, which cannot at present be controverted, that the extracts or perfumes of the various fruits which can be artificially prepared in our laboratories from the basic organic radicals, are identical, and the same with those which nature carefully elaborates in the apple, the pear, the pine-apple, banana, and the like. The whole subject has been investigated more carefully, and has been applied to more practical purposes than the public is generally aware of. Take, for instance, the well known perfumes known as 'Lublin's Extracts,' extract of geranium, millefleurs, new-mown hay, and many others; all of these are said to be prepared from two or three of the common and cheap essential oils, and from the organic radicals. In addition to perfumes the most agreeable, odors of the most disgusting and nauseous character can also be produced by like means; as for instance the odor of the bedbug, squash-bug, and of many of the weeds and plants. As an odor and perfume of a different character can be produced by the action of each different acid on the different oxides of the organic radicals, the number of bodies of this character capable of being produced is almost innumerable, and may possibly embrace every known odor or perfume which is now recognised in the animal, vegetable, or mineral kingdom.

"The various artificial extracts of fruit have been applied to the flavoring of an agreeable species of confectionary known as the 'acidulated fruit drops.' These have been denounced as poisonous by some persons on the ground that fusel oil is known to produce deleterious effects; and as a natural consequence the confectionary referred to has been discarded. There is, however, no foundation for such statements or belief; and if the confectionary flavored with these extracts has in any case produced injurious effects, it is undoubtedly to be referred to an injudicious consumption of it, and not to any inherent deleterious property."

Translated for the Journal of the Franklin Institute.

Rolled Sheets of Bitumen.

MM. Aumeteyer believe that they have made a valuable improvement in the use of bitumens, by submitting them to rolling. The bitumens, say they, have been proved as to their qualities and endurance; their water-repelling properties and impermeability cause them to be more and more sought for every day; but up to the present time, no one had thought of rolling them out, and reducing them to thin sheets, easily to be laid when cold, like zinc and lead. This new mode of treatment does away, in the first place, with the inconveniences of melting on the spot, which is so disagreeable; and it gives to the bitumens, besides, a density and solidity which they have not yet attained; it assures them an indefinite durability.

Thus prepared, bitumen will very advantageously replace slate, zinc, lead, thatch, &c., as coverings for terraces, buildings, &c. It melts, but does not inflame; and would rather extinguish than nourish combustion. They are incomparably lighter even than slates, and are non-conductors both of heat and electricity; they cost less even than thatch, require no attention, and are in no way affected by atmospheric influences; they are impermeable to water, &c., &c. They will be of great service in rendering damp places healthy; they are applied without difficulty to walls, and adhere strongly; a cellar whose walls were covered with rolled bitumen or asphalte, would be as healthy and as habitable as the upper story, provided light finds access, and the air is sufficiently renewed. In water-conduits, reservoirs, basins, baths, washing establishments, and silos for the preservation of grains and vegetables, these sheets of bitumen, so thin, yet as unalterable as metals, will be of immense service. Easily painted, they may be employed either for wall-hanging or for floors.

Cosmos, 21*st October*, 1853.

An Improved Material applicable to many purposes for which Papier Maché and Gutta Percha have been or may be used. Patented by PETER WARREN, October 12, 1852.*

This invention consists in manufacturing a new material or composition of a character analogous to papier maché, which is capable of being employed either as a substitute for papier maché or gutta percha, and its compounds, in forming or manufacturing various articles for which these substances are now used, such as panels and mouldings for railway carriages, trays, picture and other frames, door knobs, buttons, &c., by treating the straw of any fibrous vegetable material in the manner hereinafter described. In order to carry out this invention, straw of any fibrous vegetable substances, such as wheat, barley, oats, rye, and other similar straws, are cut into short lengths, by means of any suitable cutting machine. When these straws have any knots, it is necessary to open out and divide the same, which is effected by passing the straw through a pair of millstones, or between crushing rollers; or they may be submitted to the action of any other equivalent apparatus, so that the knots and

* From the London Repertory of Patent Inventions, Sept. 1853.

fibres may be thoroughly and effectually separated and divided. In some cases, either hot or cold water, or other liquid is applied to the materials under operation, in order to facilitate their process. The cut and divided straw is then boiled in a strong alkaline ley, or solution of caustic alkali, such as soda, potash, &c., until a pulpy mass is produced,—which effect will, however, greatly depend on the nature of the straw operated on, and the strength of the alkaline ley, or solution which is employed. The mass is then transferred to the machine known in the paper making trade as the rag engine, where it is reduced to pulp, in the manner usually practised when operating on rags, &c., in the manufacture of paper. The pulp is then partially dried; in which state it may be pressed or rolled into sheets, or moulded into other forms. These sheets or moulded articles are then dipped into oleaginous or glutinous matter, or oil, and are afterwards baked in an oven similar to that employed when manufacturing sheets or moulded articles of papier maché. The sheets or moulded articles, thus formed or manufactured, may be ornamented in any desired manner, either by japaning, or painting and varnishing, or by inlaying the surface with shell, or other analogous material, as is commonly practised in the ornamenting of articles composed of papier maché and gutta percha. When the sheets or moulded articles are required to be colored, pigments or coloring matter might be introduced into the pulp while in the rag engine; the subsequent processes of drying, rolling, pressing, or moulding, being performed as previously described.

The patentee claims the manufacture of a material which may be used as a substitute for papier maché, and for many purposes to which papier maché and gutta percha have been or may be employed, from straw pulp submitted to pressure, and then oiled and baked as hereinbefore described.

For the Journal of the Franklin Institute.

A Visit to the Gap Mine of Lancaster County.

This mine is situated about four and a-half miles from Christiana, in the County of Lancaster. It was first worked in the year 1732, and subsequently wrought again by a company in the year 1797. The only particulars now known relating to those operations may be seen in a pamphlet in the Philadelphia Library, No. 9125, from which it appears that the produce at that time was copperas and precipitate of copper, from the vitriolic water which issued from the veins. At that period the veins were not explored to any considerable extent, and the work chiefly consisted of surface explorations, although they succeeded by the aid of the imperfect machinery they then had, in sinking a shaft to the depth of from sixty to eighty feet; but the water was such an impediment, that the veins could not be pursued at that depth. Latterly these mines have been purchased by a company of gentlemen of the city of Philadelphia, who have a charter from the Legislature under the title of the Gap Mining Company. They have erected a steam engine on the works, and sunk the original shaft to the depth of 100 feet, from which a gallery is extended some 200 or 300 feet. They have also extended the old works at a depth of 60 feet, and sunk several shafts to

determine the extent of the veins, for there appears to be several veins running parallel to one another, and one vein running transverse to these parallel veins. These veins are all from 10 to 15 feet wide, producing copper and other ores; but as they sink deeper, it changes into nickel and cobalt ores, of which there appears to be an inexhaustible supply. These ores contain by analysis:—

Sulphur,	27·67
Iron,	48·41
Nickel,	5·67
Alumina,	1·40
Silica,	16·85
	100·00

They are now being taken to Philadelphia to be smelted. There are some hundreds of tons now lying on the surface, and some thousands of tons discovered in the mine, and extensive preparations are being made for working the mine on a large scale. L. T.

For the Journal of the Franklin Institute.

Particulars of the Steamer Yankee Blade.

Hull built by Thomas Stack, Williamsburgh, New York; machinery by the Allaire Works, New York. Intended service, New York to Aspinwall.

HULL.—		
Length on deck,	275 feet.	
Breadth of beam at midship section,	38 "	8 inches.
Depth of hold,	30 "	
Length of engine and boiler space,	82 "	
Draft of water at load line,	13 "	
Floor timbers at throats, moulded,		16 inches.
Do. do., sided,		12 "
Distance of frames apart at centres,		24 "
Masts and rig,	Three masted, foretopsail schooner.	
Tonnage,	2290 tons.	
ENGINES.—Two vertical beam.		
Diameter of cylinder,	6 feet	3 inches.
Length of stroke,	11 "	
BOILERS.—Two, return flued.		
Length of boilers,	31 feet	9 inches.
Breadth "	13 "	
Height " exclusive of steam chimney,	11 "	10 "
Number of furnaces,	12	
Length of grate bars,	7 "	6 "
Diameter of smoke pipe,	6 "	4 "
Height of smoke pipe,	66 "	
Description of coal,	Anthracite.	
WATER WHEELS.—		
Diameter,	32 feet.	
Length of blades,	8 "	6 inches.
Depth "	1 "	6 "
Number of blades,	28	

Remarks.—Hull strapped with diagonal and double laid iron straps, $4 \times \frac{5}{8}$ inch; floors are filled in solid.

For the Journal of the Franklin Institute.

Particulars of the British Steamer Curlew.

Hull built by Wm. Denny & Brothers, Dumbarton; machinery by Tullock & Denny, Dumbarton. Intended service, New York to St. Thomas.

HULL.—

Length on deck from fore part of stem to after part of stern post above the spar deck,	180 feet.	
Breadth of beam at midship section above the main wales,	25 "	
Depth of hold,	14 "	6 inches.
Draft of water at load line,	14 "	
Frame, shape and dimensions,	⌐L 4 × 3 × ⅜	
Do., distance apart at centre,	15 "	
Keelson,	16 inches deep.	
Masts and rig,	Three masted foretopsail schooner.	

ENGINES.—Vertical direct.

Diameter of cylinders,—Two of	36 inches	
Length of stroke,	3 feet.	
Maximum revolutions per minute,	60	

BOILER.—Tubular.

Maximum pressure of steam in pounds,	60
Plates, thickness,	⅝ and ½ inch.
Description of coal,	Bituminous.

SCREW.—

Diameter of screw,	12 feet.	
Number of blades,	Three.	

Remarks.—Poop deck; five water-tight bulk heads; single riveted, ⅝ inch rivets, 2½ inches apart. Clincher built and abut riveted.

For the Journal of the Franklin Institute.

A Visit to the Lead and Copper Mines of Chester County, Pennsylvania.

By L. TURNBULL, M. D., Lecturer on Chemistry.

Within a mile of each other, in the vicinity of the beautiful stream called Pickering Creek, these lead mines are situated; but I was sorry to find that they added nothing to the comfort of the farmer in whose region they were placed, for upon inquiry I was informed that every spring in their vicinity was entirley dried up, and that even the Railroad Company's supply has entirely failed. This should always be provided for by a special agreement by the farmer on whose land they operate, for it is a very serious evil to find that his spring house is no longer fitted for the storing of milk, cream, and butter.

The first mine which I visited is called the *Charleston Mine*, and is situated on the farm of Capt. Davis; it has been in operation about fifteen months, and the product is exclusively lead ore; the salts of lead are the sulphuret or galena carbonate and phosphates of lead. They have sunk a shaft of 180 feet. The vein is about two feet wide, but is apt to be filled up in many places with inferior deposit, containing very little

true lead ore. This mine is owned by a company of capitalists of Philadelphia, under the superintendence of Mr. Charles Wheatley; the chief miner, or captain of the mine, is Mr. W. Perry. To keep the mine free from water, they have in operation a beautiful Cornish whim or low pressure condensing engine, of 60 horse power, built by Mr. John West, of Norristown. In this form of engine there is a great saving of fuel; it is arranged so as to set a crushing machine in operation. They have also a horse whim and capstan, and out-house containing two giggin machines. The price given to the miner is from 30 to 35 dollars a month; above ground, they had a man and a boy; in the mine, they had 8 or 10 miners at work. But this mine has yielded but a few tons of ore, and the prospect is far from being good, being an outlay without any return.

After crossing the creek a second time, and ascending the hill about a quarter of a mile, at the corner of the wood I came to the Montgomery Company's Mine, which, before entering, presented an active spirit of industry, very different from the quiet of the Charlestown Mine, there being some four or five men, with several boys, at work above ground; the puff of the steam also causing it to be seen at a considerable distance. Upon inquiring for the Captain, I found him to be an agreeable, intelligent man, whose name was McGerk.

This mine has only been in operation for about 12 months, and has sunk a shaft some 120 feet; the encouragement to progress has been very good, the ore is abundant; but they have been considerably annoyed with the large quantity of zinc ore, which has to be separated by washing; they had some 4 or 5 tons on hand. They have a small horizontal high pressure engine at work, and the horse whim was in active operation, dragging up ore, which is principally galena and phosphate of lead. They had some 15 miners at work, and one of them was complaining of the want of proper ventilation in the mine, so that their lamp or candle would not burn, and they had to come up after each blast to get rid of the smoke; this I have found a great defect in most of the mines that I have visited, and some endeavor should be made to obviate it.

The third mine visited, being about half a mile from the Montgomery Mine, is called Sherwood's, but every thing about the mine looks desolate; as all operations have been stopped for several months; the iron work is rusting; the only miner at work was a Cornish man, who, with a little boy, was washing carefully with a buddle the refuse washings of former operations; he was making about a ton of ore, with much care, in about two weeks, yielding 60 per cent.; this, he said, was poor work, as they only gave him 15 dollars a ton for it. He had been a washer of ores in Cornwall, and his father before him, commencing at the age of eight years; but he was very desirous of getting to Mineral Point, where he had two uncles; he said he should then feel as if he were at home in one sense.

I then passed over into Mr. Sherwood's smelting house, where he produces about fifty to fifty-five tons of lead from every hundred pounds of rich ore, and if the ore is galena they then can extract from twenty-five to thirty-seven ounces of silver from the ton of metallic lead by cupellation. They I find are erecting the brick work for a series of boilers, so as to go into operation and extract the silver by the new process of Pattenson, by

taking advantage of the crystallization of the lead, so as to remove it, and leave the lead which remains with a large quantity of silver, and by cupellation there is less of lead oxidized and fewer of the cupels employed. The chemist's name is Mr. W. Johnston.

The fourth mine is situated on Funks' place; their shaft has been sunk some ninety feet, and they are about increasing the depth, there being some little encouragement to do so; they have also a steam engine in active operation; this mine has only been open within the year 1852.

Across a single field is situated the Wheatley Mine, the deepest lead mine in this region, being some two hundred feet, with levels run in several directions. The old or first shaft is employed for raising refuse matter but at the shaft back of the blacksmith's shop they are raising ore. There are some four shafts at different points, and the ore is the same as that found at the Charlestown mine. In Mr Wheatley's collection of ores of lead from this mine, there are two varieties of galenas, fibrous, and steel grained, the latter being richer in silver than the former; there are also phosphates, chromo-molybdinate, with beautiful crystals of sulphate, in the centre of geodes of galena; also, fine specimens of carbonate. They have a large bucket wheel driven by water, which driving two large iron wheels crushes the ore; the number of men and boys employed in washing and sorting being greater than at any other of the mines in that region. They are also digging all over the fields in the immediate vicinity for ore; their steam engine is high pressure, and the prospects of this mine are stated to be good, but of the amount of ore raised, cost of raising, &c., I could not find any account, although I desired the information. Having spent some time at this mine, I started for the copper mine on Judge Morris's beautiful farm, which is situated about two miles from Wheatley's mine, and a quarter of a mile south of Phœnixville, a square off from the state road, in a grove of trees. The mine is owned by a New York company, who commenced working last summer (1853), and brought out a good deal of ore but found that the steam engine employed by them was too small, the water having increased so much; they are now erecting one of one hundred and eighty horse power, with a fly wheel twenty-five feet in diameter, in a very substantial manner. The vein of sulphuret and carbonate of copper runs in an easterly direction, directly under the Judge's house, and varies from eighteen inches to four feet; they have upon the ground some twenty or thirty tons of ore, which, as far as I could judge, was not very rich, but still if they have an abundance of it, there will be no doubt it will pay, at the present prices of copper ore in the market. The owners, workmen, and the persons around the works, speak in the highest terms of the encouraging prospect of the mine; still I do not consider the ore as rich as that of the Perkiomen Mining Company, but the expense of raising the ore will be much less.

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*Remarks on Improvements in Paving—Granite or Wood.**

Messrs. Perkes & Co., the engineers, of Walbrook, have recently patented, and submitted for public patronage, a novel system of construc-

* From the London Mining Journal, No. 946.

tion for the pavement of roads, bridges, &c. Proceeding on the principle that the inequalities in the best of pavements are first caused by the partial collapse or sinking of the foundation, or sub-strata, they have, to a certain extent, rendered the finished portion of the road independent of the homogeniety and solidity of the concrete beneath. The plan consists in casting in sections of 3 feet square a series of iron boxes, beds, or chambers, 8 inches long, 3 inches broad, and 4 inches deep, into each of which a block of wood is placed, with the grain in a vertical position, or a block of granite, made to fit with moderate exactness, and standing about 2 inches above the iron framework. By this arrangement, the total number of sections being made to break joint, and firmly keyed together, gives great solidity, avoids all tendency to partial sinking in holes, secures a good foothold for the horse, whether gravel is used as an upper coating or not, and as one or more blocks, more soft than others, show signs of wear or decay, they may be instantly, and with great facility, replaced by others. Another peculiar feature may be noticed, which will prove a source of economy; it is proposed to make the compartments for streets of greatest thoroughfare the deepest, for secondary streets perhaps 1½ inches less in depth, and for those of third class traffic more shallow still. By these means, when the blocks are so worn as to require removal in a first class street, they may be removed to a second class, and from thence again to a third, thus getting the utmost possible utility out of the material employed. It will be noticed that either wood or stone can be employed; but as a wood pavement, combining economy with non-slipperiness, is a great desideratum, we would suggest that the patentees should obtain permission to lay down a piece as a specimen, composed of wood, with the grain vertical, in some moderately crowded carriage thoroughfare, and thus give the invention a somewhat severe test, by which its real merits might be appreciated.

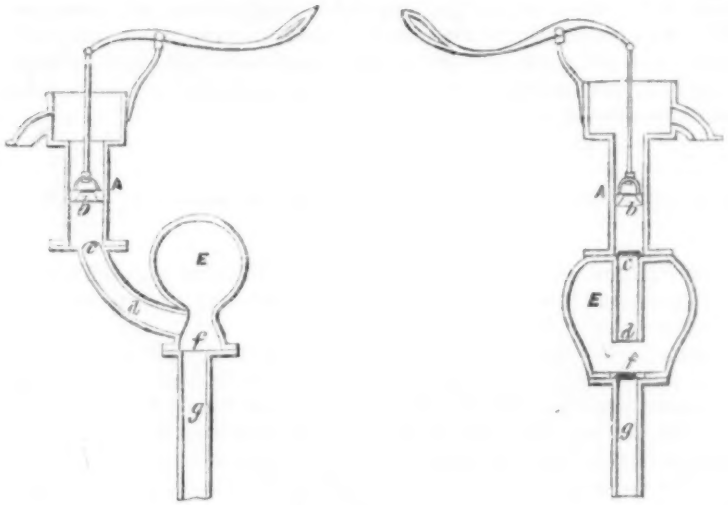
On the Application of Air Chambers to Pump Suction Pipes. By W. Baddeley, Esq.*

In the "Report of the Juries," Exhibition, 1851, at page 178, there appear the following remarks, by the Rev. H. Moseley, reporter to Class V., upon the subject in question:

"A remedy for some of the evils (previously enumerated) in the working of a pump has been sought in the application to it of a second† air vessel, communicating with the suction pipe immediately below the barrel, or with the top of the suction pipe and the bottom of the barrel. The commencement of each stroke is eased by a supply of water from this air chamber to the space beneath‡ it. The influx of the water into that space is aided by the pressure of the condensed§ air in the air chamber, and when the stroke is completed, the state of condensation of this air (?) is, by the momentum of the water in the suction pipe, restored, causing it

*From the London Mechanic's Magazine, November, 1853.
†There may be, and usually is, no first.—W. B.
‡It may be above.—W B.
§There can be no condensed air in that arrangement.

to rush through the passage by which that pipe communicates with the air chamber. Thus, by this contrivance, the surplus work, or half the *vis viva*, which remains in the water of the suction pipe at the conclusion of each stroke, is stored up in the compressed air of the air chamber, and helps to begin the next stroke of the piston. The suction air chamber has been added to a common suction pipe, exhibited by Mr. Self, in the agricultural department, where, being made of glass, its action was readily to be seen. It is also introduced in a class of small pumps, called 'fire-syringes,' exhibited by Mr. Baddeley,* and Messrs. Shand and Mason.† Except in the case of the Canadian engine, it does not, however, appear to have been applied to any of the larger class of engines exhibited.‡ 'It should probably be constructed of much larger dimensions than have been given to it in either of these engines!!!' When the high character of the jurors, and the well known talents of their reporter is considered, it is a matter of unfeigned regret that the report upon the highly important subjects contained in Class V. of the Great Exhibition should have been so meagre in its character, and display throughout such an evident want of care in its preparation. Sins of omission and of commission abound. Of five exhibitors, honorable mention is made in the body of the Report (page 179); but not being included in the tabular list of awards, no publication of the fact ever took place, as in other classes, nor were these exhibitors aware of the distinction intended to be conveyed until they received a copy of the 'Juries' Report,' long after the Exhibition closed!



Herewith I send two sketches of common suction pumps, fitted with an air vessel upon the feed pipe. A is the pump barrel; *b* the bucket; *c*

*Described in *Mech. Mag.*, vol. liv., p. 390.

†Described in *Mech. Mag.*, vol. lii., p. 290. But in neither of these contrivances is any suction chamber employed!

‡Another notable mistake.

the lower pump valve; *d* the pipe leading to the air chamber E; *f* is a second valve on the upper part of the pipe *g*. We may suppose the difference between the two water levels (that is, in the well and the pump) to be about 20 feet. When the pump is first worked, its operation will be to partially exhaust or rarefy the air in all the passages between the pump bucket and the water, until it is about one-third of its original density; say equal to a pressure of about 5 lbs. upon the square inch. As this point is approached, the water rises to the pump, occupying the whole of the passages, *g*, *d*, and A, and a portion (about two-thirds) of the air chamber E, its upper part being occupied by rarefied air of the density before stated. If the relative proportions of the pump and feed pipe, and the speed at which it is worked, are such that the power expended at every stroke is just sufficient to bring the water raised to rest at the end of each stroke, no practical benefit will result from the employment of the air vessel. But if the dimensions of the pump barrel and feed pipe differ considerably, and the pump is worked so fast as to produce a considerable initial velocity of the water in the feed pipe, then the air chamber comes into useful operation. The *vis viva* (momentum)* of the water will cause it to rush into the air chamber E, increasing relatively the density of the air, but never, or rarely, reaching atmospheric equilibrium, much less condensation. On again raising the pump bucket and exhausting the barrel, a portion of the water is drawn from the air chamber E, and the air above it attenuated, when the column of water in the feed pipe *g*, is set in motion, supplying the requirement of the pump barrel and expending its *vis viva* in a surplus supply to the air chamber, and so on continuously. "The nature of this action," says the writer before quoted, "will be best understood from that of the hydraulic ram. The contrivance constitutes indeed, in some respects, a union of the action of the ram with that of the pump; and, besides accomplishing the object for which it was applied, appears to have the effect of considerably economizing the power employed in working pumps." The difference is, that in the suction air chamber the air is rarefied, that is, less than atmospheric pressure; whereas, in the hydraulic ram, the air is in a state of condensation considerably greater than atmospheric pressure.

In the case of the fire-engine from Canada, the jurors commend "the large proportion of the sectional area of the suction pipe to that of the barrel;" as also "the application of an air chamber to the suction pipe," which the large proportion of the former rendered needless, and the absence of a valve rendered inoperative. The same remark is applicable to another engine exhibited, but not specially noticed in the Report.

13, *Angell-terrace, Islington, Nov.* 9, 1853.

Iron Ships struck by Lightning. By W. Snow Harris.†

It having been asserted that there is no record of iron ships having been struck by lightning, although they have been in all climates, Mr. W. Snow Harris writes—"This is, I beg to say, a great misapprehension. Her Majesty's ships *Bloodhound* and *Jackall*, both built of iron, were

* [*Vis viva* and momentum are not equivalent terms.—Ed. M. M.]

† From the London Mining Journal, No. 948.

struck by lightning off Lagos—the *Bloodhound* in Oct. 1851, and the *Jackall* in Sept. 1852. The damage was considerable. The *Bloodhound* had her foretopgallant-mast and topmast shivered, and her sails burned. The *Jackall* also had her foretop-mast shivered, and other damage. I venture to call attention to these facts, lest an erroneous, and perhaps unfortunate, impression may arise in the public mind relative to the immunity of iron ships from the effects of lightning. As I never venture on any opinion connected with this subject which I cannot support by facts, I beg to refer for further information to the logs, &c., of those vessels deposited at the Admiralty. The fact is that an iron ship is just as likely to be struck by lightning as any other ship, although little damage would arise to the hull or shell of the vessel when the electrical discharge had fairly reached it. We must, however, be prepared to encounter the same amount of danger in all the imperfect conducting substances intermediate between the masts and shell of the vessel as we find occurring in ships of wood, supposing the ship had no regular fixed conductor. I beg permission also to correct another misapprehension which appears to have arisen relative to steam-ships. The *New York Tribune* has an article on ships damaged by lightning, from which the public may be led to conclude that no steam-vessel is liable to damage from the electrical discharge; and this I have found repeated in other quarters. Now, to show the fallacy of such an opinion, it will be sufficient to refer to the logs of her Majesty's steam-ships *Blazer*, *Gorgon*, and *Rhadamanthus*, as also to several cases in the West India and Oriental Company's steam mail ships, all of which have been struck by lightning, and considerable damage ensued. In her Majesty's steam ship *Blazer*, struck by the electrical discharge, on 20th March, 1839, in the Mediterranean, 30 feet of the sponsons were blown out, all the iron stanchions started, the maintopgallant-mast shivered in pieces, mainmast damaged, rigging set on fire, cabin filled with smoke, the chain haulyards knocked in pieces, so that the links strewed the decks; two persons were struck down and nearly killed. The idea, therefore, of the security of life from lightning in such ships is quite a mistake. I have ventured on these remarks solely with a view of correcting a false impression, which might lead to ill consequences to the public interest, and in a purely philosophical spirit.

Windsor Villas, Plymouth, Oct. 19.

To Find the Strength of Wrought Iron Plate Girders. By E. W. Tarn.*

In a former paper on this subject (p. 646,) we showed how a formula might be obtained for calculating the weight which may be safely laid on a girder; we will now further elucidate the subject by applying the formula to a few examples.

The equation which we obtained was as follows:—

$$w = \frac{4f \times (\mathrm{CN})^2 \times (2t \times \mathrm{AB} + \frac{2}{3}s \times \mathrm{CN} + 4a)}{l}$$

f being found from the equation, $f \times \mathrm{CN} = 8$ tons. It must be ob-

* From the London Builder, No. 561.

served that f is not a constant, but varies with the depth of the girder so as to make $f \times$ CN a constant.

This value of w can be simplified by substituting for f its value, and the formula then becomes, $w = \frac{32 \times \mathrm{CN} \times (2t \times \mathrm{AB} + \frac{2}{3}s \times \mathrm{CN} + 4s)}{l}$ w being the weight in tons which may be safely laid on the centre of the girder, and $2w$ is the weight which may be safely distributed over the whole length.

Example 1.—Let CN $= 6$ in. AB $= 5$ in. $l = 10$ ft. $= 120$ in. $s = \frac{1}{2}$ in. $t = \frac{1}{2}$ in. $a = 1$ square inch; then $w = \frac{32 \times 6 \times (5 + 2 + 4)}{120} = 17{\cdot}6$ tons, or the girder will safely bear $17\frac{1}{2}$ tons laid on the centre, and 35 tons distributed over the whole length.

Example 2.—Let the length of the girder be double that of the last, all the other dimensions remaining the same, then $l = 20$ feet $= 240$ ins., $w = \frac{32 \times 6 \times (5 + 2 + 4)}{240} = 8{\cdot}8$ tons, or the strength is half that of the former example.

Example 3.—Let the depth be doubled, all the other dimensions remaining the same as in the last example; then CN $= 12$ inches, $w = \frac{32 \times 12 \times (5 + 4 + 4)}{240} = 20{\cdot}8$ tons, which shows how much more strength is gained by increasing the depth than by increasing any other dimension, a principle which holds in beams of every description.

For the benefit of those readers who are unable to interpret an algebraical expression, we will express the value of w in words, and thereby enable any persons who are only acquainted with the first four rules of arithmetic to apply this formula for themselves.

1. Multiply the width AB in inches by twice its thickness.
2. Multiply the half depth CN in inches by two-thirds of its thickness.
3. Multiply the area of section of one of the angle irons in square inches by 4.
4. Add together all the preceding results, and multiply the number thus obtained by 32 times the depth CN in inches.
5. Divide this last result by the length of the girder in inches, and this gives the weight in tons which may be safely suspended from the middle of the girder.

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*Petition to the Privy Council against the use of Stage Coaches.**

The following minutes of proceedings, "At the Court at Whitehall, the 20th of November, 1672; present, the King's Most Excellent Ma^{ty}" &c. extracted from the "Council Register" (ch. ii. vol. x. p. 337), and for which we are indebted to Mr. Robert Lemon, are very instructive and curious, showing as they do how ignorance and personal interest have ever fought against improvement and progress:—

* From the London Builder, No. 564.

"The humble petition of ye masters and wardens and governors of ye severall companys of sadlers, cutlers, girdlers, cordwayners, curriers, loryners, inholders, farriers, spurriers, and watermen of the Citty of London, presented with the approbation and by the consent of the Lord Mayor and Court of Aldermen of the said Citty, on behalf of themselves and ye rest of ye members of the aforesaid severall companys, and divers other tradesmen and hackney coachmen, in the Cittys of London and Westminster, the burrough of Southwarke, and countys of Middx and Surrey, and other places within this Kingdome, being this day read at the boord, and there being at the same time likewise presented severall petitions from the cittys of Norwich, New Sarum, Bristoll, and Glocester, and from ye townes of Northampton, Daventry, Marleborough, St. Alban's, Maidenhead, Staynes, and Theale, All setting forth, that by reason of the many running stage coaches and carravans of late yeares set up, for carrying passengers to almost all places within this kingdome, not only petrs trades are lost, and above 100,000 familys reduced to beggery already, and many thousands more like suddenly to fall upon ye severall parishes wherein they dwell, for maintenance, but many other great mischeifes to this Kingdome are occasioned, for by them ye roads are spoyled, the rents of all inns lessened, inholders made unable to pay their rents and dutys, or to provide fit accomodation for their guest, or to releive the poor, as formerly they were wont to do, the consumption of all sorts of provisions for man and beast are prevented, the rents of gentlemen's estates brought downe, the breed of good horses destroyed, the keeping of great numbers of horses, both in ye Citty by merchants and others, and in the country and all great townes of England, is left off, which hinders ye consumption of vast quantitys of horsemeat; the breeding of many thousands of watermen hath been hindred, and those that are bred are greatly hurt and discouraged by them; his Maes subjects, unused to riding, are growne carelesse of attayning to good horsemanship, a thing so necessary for them to understand, in order to their owne and ye kingdomes service; the consumption of woolen, leather, and other manufactories of ye kingdome, are greatly lessened, whereby, the handicraft tradesmen aforesaid, who formerly lived well, helped to consume provisions, and releive others, are for want of worke ready to starve. They ruine the hackney coachmen in London, who are licensed and pay five pounds pr ann: for their license, and do greatly annoy and breake the streets, without paying anything towards reparation. The revenue of excise and Post-office is much abated, the kingdome is weakened, and the subjects are made unfit for his Maes service, and, therefore, praying the said coaches may be suppressed, or such order speedily taken therein as shall be thought most conducing to the good of his Mates subjects.

It was ordered by his Maty in Councill, that the matter of these petitions be taken into consideration at this boord on Wensday, the 4th of December next; whereof the petrs are to cause timely notice to be given to as many of ye chief owners of ye hackney stage coaches and carravans that travell ye northerne, westerne, and other great roads of this kingdome, as they conveniently can; and that ye said keepers of coaches and carravans, as also some person or persons appointed by the petrs, do give

their attendance at ye time and place aforesaid; and it was further ordered that both partys have liberty to bring with them councill learned if they please."

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*On the Progress and Present State of the Electric Telegraphs.**

The explanation which we gave in our last Journal of the remarkable improvements in the electric telegraph has attracted very general attention, and the prospectus of the Universal Electric Telegraph Company is now before the public, under a highly influential directory. As the subject is one of intense scientific interest, as well as of great national importance, we this day devote our columns to a further elucidation of the progress and present state of that art. The electric telegraphs at present in operation may be divided into four classes—First, those the pointers or indices of which move in front of dials by the agency of the electric current inside or beneath them. Second, those the indications of which are marked by the breaking up of a continuous line, and dividing it into short and long lines and spaces. Third, telegraphs showing letters, in which a pointer on a dial is made, by the agency of electricity beneath or behind the dial, to give motion to a wheel governed by an escapement, and then to a hand in front of the dial. Fourth, letter or type-printing telegraphs, in which the letter or metallic type is brought to a position, and while there made to impinge on paper, or otherwise to give the impression.

In the first class may be placed Cooke's and Wheatstone's telegraph, as used by the Electric Telegraph Company; Highton's, as used by the British Telegraph Company; Henley's and Foster's, as used by the Irish Magnetic Telegraph Company; Deering's, as used by the Submarine and European Telegraph Company; and Allen's, as proposed to be used by the United Kingdom Telegraph Company. The second class embraces Bain's Telegraph, as used by the General Telegraph Company on a few of their principal lines, the paper on which the line is made being in this plan saturated with a metallic solution; and Morse's, used in America, in which plain paper is employed, and which is now introduced by the British Telegraph Company on some of their lines, in preference to the pointer telegraph of Highton, previously referred to. To these may be added Bakewell's copying telegraph, which, by a series of broken lines placed one under the other, leaves the letter indicated, or rather omitted, by the spaces in the broken lines. In the third class may be placed Wheatstone's original telegraph, now belonging to the Electric Telegraph Company; Highton's, to the British Telegraph Company; Gamble and Nott's, to the Electric Telegraph Company; Allen's, proposed to be used by the United Kingdom Telegraph Company; and others of less note. The dial system is, however, subject to this objection, that when the hand is standing at O, or what ought to be the starting point, it must, in order to spell a word, traverse or pass over other letters on the dial, varying in distance according to the position of the word in the alphabet, and this it must do in spelling every word. Under

* From the London Railway and Commercial Gazette, No. 952.

the fourth class, the letter or type-printing telegraphs, must be classed Brett's telegraph, belonging to the Submarine Telegraph Company, and House's, as in use in America.

The advantages of the new telegraph now proposed to be worked by the Universal Electric Telegraph Company over the telegraphs comprised in the first class are, that the signals or indications corresponding with the movement of the needles or pointers are made and marked legibly and distinctly, so rapidly that needles or pointers moving at the same rate could not be read by the most experienced operator. To this must, of course, be added the incalculable advantage of having the communication fixed and recorded on paper, instead of the mere flickering and fleeting movements of pointers. In the first instance, the operation may be carried on with a rapidity never contemplated in former telegraphs; and in the second instance, the communication is permanent, and may be kept and proved in years after, like a short-hand writer's note, by any person master of the alphabet. A further marked superiority consists in this—that in all telegraphs worked on the principle of the first class, one operator is required in the first instance to read the motions of the pointers, and another at the same time to write them down. In the new telegraph only one operator will be required, who will write down the several communications as they appear on the paper before him, and at the same time; and thus there is a saving of one-half of the staff of operators.

Telegraphs of the second class presented certain advantages—namely, rapidity, simplicity, and clearness of character. Bain's telegraph consisted of an iron pointer or stilus, pressed upon paper saturated and kept moist with a metallic solution. Marks are made upon the paper by the passage of the electric current from any distance through the stilus, and consequently through paper in its passage to the earth, acting upon or decomposing both the iron stilus and the solution on the paper, and leaving after it a dark mark. By this system it is evident that if the current is continuous through the wire, and the paper be drawn regularly under the stilus, the result will be a dark line; and if the current be passed irregularly and in pulsations, the line will be broken; and when the current ceases to pass along the wire, no mark whatever will appear. The principle of Morse's telegraph is nearly similar; but instead of a metallic pointer acting chemically, and being in its turn chemically acted upon, this invention is a mechanical telegraph, giving precisely similar results. A lever is used, being depressed at one end and raised at the other, while the current is passing through a magnet at one extremity. A pin is placed at the raised end of the lever, which scratches the paper on contact, while the current is passing, and the paper moving under the pin end of the lever. If the current is passing in pulsations, the line is of course broken; and when the current ceases to pass through the magnet, the line also ceases to appear. The only form of cipher or character which these telegraphs can represent is short or long lines—thus one short line may be called *a*, two short lines *b*, three short lines *c*, one long line D, two E, three F, so that to obtain 30 letters or conventional signs, a greater number of long or short lines, or of both, have to be used. Increased rapidity will be secured by the new telegraph from the circum-

stance, that instead of one short pulsation or dot, representing one letter, it will represent two letters, two will represent four, and so on ; and the same with continuous lines, so that with one, two, and three short pulsations, and one, two, and three long pulsations, instead of making, as in Morse and Bain's telegraphs, only six signs or letters, twenty-eight or more can be made, thus exceeding the whole alphabet. It is evident, therefore, that instead of seeking other and longer combinations, as must be the case with the other telegraphs, the new company will be enabled to make all necessary combinations with the newly invented telegraph. Simplicity is secured by the new telegraph using paper that does not require any preparation, either chemical or mechanical, and that is only one-fourth of the expense of that required for Morse's telegraph.

Clearness is obtained by the length and size of the distinguishing characters ; for instance, one short pulsation of either Morse's or Bain's telegraph makes a dot or short line of about one-sixteenth of an inch long. In the new telegraph, a similar pulsation will make a character resembling a V, or angular or arrow-pointed form, having a base about the same length as the short line above specified, and a depth in the sides of an eighth of an inch, being therefore much more distinct. Another superiority, known chiefly or only to telegraphers themselves, exists ; for in consequence of the characters presenting a continuous line, and there being only sufficient distinguishing space left between them, they are not subject to the same defects, or likely to be read wrong, as constantly occurs in other telegraphs.

No comparison need be made with the third class: they are admitted to be so inferior to telegraphs of the first and second class; depending on an irregular vibrating movement, the slightest casual irregularity or fluctuation entails the certainty of mistake in the entire word or message.

The advantages of the improved system over telegraphs of the fourth class are numerous. Although the public are apt to be attracted and misled by the supposed benefits to be derived from the telegraphs printing the letters in Roman and other readable type, there are more imperfections attending this class than are generally supposed, and which are known only to operators themselves. They depend, like those of the third class, upon a fluctuating movement of an escape-wheel, governed by an escapement, which may possibly, and often does, pass one too many, or one too few. As the type is a fixture on the wheel motion, when such a mistake occurs, the receiver must know from the sense or nonsense of what he receives by the telegraph that something is wrong with the machinery ; by no means an uncommon occurrence. Perhaps the best, or, notwithstanding its extreme complexity, the most efficient telegraph of this class, is the American one of Mr. House. Even when used under his own eye, it appears to be liable to serious mishaps, and would seem to be inferior in rapidity to either Morse's or Bain's telegraphs, which are of the second class.

In the telegraphs of the fourth class, the current transmitted along the wire has to bring into operation certain complicated apparatus or machinery, upon the correct movement of which depends the accurate transmission of the message. The superiority of the Universal Compa-

ny's Telegraph over the last mentioned class consists in simplicity, comparatively less cost, more rapidity, and no necessity for correcting errors, as even a mistake in one letter is not entailed on the one that follows it.

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*Ocean Steamers.**

The discussion upon the Paper on "Ocean Steamers," by Mr. Andrew Henderson, Assoc. Inst. C. E., was commenced by quoting from an article in the *Edinburgh Journal*, by Professor Tennant, of St. Andrews, the dimensions of some of the large ships built by the ancients; whence it appeared that a ship, constructed by Ptolomœus Philopater, was 420 feet long, 56 feet broad, and 72 feet high from the keel to the prow; and was manned by four thousand rowers, four hundred servants, and two thousand eight hundred and twenty marines. Hiero, King of Syracuse, caused to be built, by Archias, the Corinthian shipwright, under the supervision of Archimedes, a vessel which appeared to have been armed for war, and sumptuously fitted for a pleasure yacht, and yet was ultimately used to carry corn; the dimensions were not recorded, but as there were twenty banks of oars, and three masts,—the timber for the mainmast, after being in vain sought for in Italy, being brought from England,—and the cargo was sixty thousand measures of corn, besides vast quantities of provisions, &c., for the crew, the dimensions must have exceeded those of any ships of the present day; indeed, Hiero, finding that none of the surrounding harbors sufficed to receive his leviathan, loaded it with corn, and presented the vessel, with its cargo, to Ptolemy, King of Egypt; and on arriving at Alexandria, it was hauled ashore, and nothing more was recorded respecting it.

Taking these dimensions as the basis for calculating the tonnage, by the old law, or builders' measurement, and, in accordance with the report of the late Tonnage Committee, taking the average tonnage of ships as amounting to twenty-seven hundredths of the external bulk, measured to the medium height of the upper deck, the burthen and cubic content of these vessels will be—

	Tonnage.	External bulk.
Ptolomœus Philopater's ship	= 6,445 tons,	830,700 cubic feet.
Noah's Ark, . .	= 11,905 "	1,580,000 "

and contrasting with these a few modern ships:

Great Western, . .	= 1,242 "	161,100 "
Great Britain, . . .	= 3,445 "	446,570 "
Arctic (American packet),	= 2,745 "	356,333 "
Hymalaya, . . .	= 3,528 "	457,232 "

and, calculating by the same rules, taking the dimensions given in the prospectus of the Eastern Steam Navigation Company, their

Proposed iron ship, . = 22,942 tons, 2,973.593 cubic feet.

It was, however, stated that this vessel was intended to be 10,000 tons register, which might be correct, if it was built on the cellular system, and was measured internally, by the present law. This latter example

*From the London Mechanics' Magazine, November, 1853.

was only given to demonstrate the advantage of adopting the proposed system of using the mean of external and internal measurement as the basis of the calculation of the tonnage, and of recording all the dimensions, and the scale of burthen on the certificate of survey.

It was admitted that there was much ingenuity in the proposed system of descriptive measurement, but it was argued that the present law rather favored the construction of well-formed vessels, as the fiscal tax fell lighter upon them than upon bad ships. The utility, in a scientific point of view, as well as commercially, was strongly urged, of adopting a system of measurement which should record the dimensions, capacity, and scantling, and form a classification of the comparative merits of all ships.

It was suggested that the discussion would be more useful if it was, for the present, confined to the consideration of the advantages and disadvantages of the proposed large classes of sailing ships and steamers, with respect to their scientific construction, their capabilities for navigation, and their commercial economy, as the law of measurement could scarcely be combined with these questions.

The first point then considered was, the effect of heavy seas upon vessels of 400 to 600 feet long. The waves of the Atlantic were stated, by some captains of American "liners," to attain an elevation of about 20 feet, with a length of 160 feet, and a velocity of 25 to 30 miles per hour. Dr. Scoresby, in his paper on Atlantic Waves, gave about the same mean elevation for the waves in rather a hard gale ahead; on one occasion, with a hard gale and heavy squalls, some few waves attained a height of 43 feet, with a length of nearly 600 feet, and a velocity exceeding 30 miles an hour. Other authorities assumed even more than those heights and distances.

The amount of strength, to resist the impact of such waves, must vary with the length and size of a ship, and the materials of which it was constructed; and as the experience of the Britannia bridge showed, that a weight of 460 tons, at a velocity of 30 miles per hour, could be borne by a cellular tube of 460 feet span, it was demonstrated, that by the use of iron, almost any amount of strength could be given to a vessel, and as stability could be imparted by proper proportions, efficient vessels could be built of any dimensions, as had been exemplified by the *Great Britain*, which, after remaining ashore on rocks for several months, had been got off without serious injury. There were, however, objections to the use of iron alone for vessels; therefore many other systems had been essayed, such as all English oak, pine of large scantling, three thicknesses of diagonal planking, and iron framing with stout planking; this last combination, with the addition of fore and aft ties and water-tight bulk heads, was advocated for efficiency and economy.

The proportion of about six breadths for the length, were insisted upon; and it was noticed, that these were given as the dimensions of Noah's Ark, as recorded in Holy Writ.

The effect of heavy waves upon vessels of great length was discussed, particularly when in the trough of the sea, and without sufficient "way on" to enable the rudder to act; under such circumstances it was suggested that there might be a bow rudder, and a propeller so placed as to

assist the action of the helm in bringing the vessel round. The necessity for the formation of capacious docks and harbors expressly for such large vessels was pointed out, as until that was done they must load and discharge in the river or roadstead.

It was admitted, that the proposed record of construction would be of scientific value, but the advantage of making it a part of the ordinary register was questioned. The full consideration of the best form of fishing and life-boats which had been incidentally mentioned was strongly urged, on scientific grounds and in the interests of humanity. The questions of what were, scientifically, the limits of bulk of vessels, and power of engines, and commercially the most profitable dimensions for carrying cargoes and passengers, bearing in mind the period of inactivity, whilst loading in port, were shown to be the main points for useful consideration, as it was as much the province of the engineer to consider the commercial result, as the details of execution of any proposed construction, or plan of operations.

The innovations proposed by Mr. Roberts, and illustrated by his models, were examined. An examination was made of the project for transmitting letters between Holyhead and Dublin, at a speed of 22½ statute miles per hour; of that for communicating between New York and Liverpool in six days, at an average speed of 22 nautical miles per hour; and for steaming to Calcutta and back, without re-coaling, traversing a distance of about 25,000 nautical miles, at an average speed of 15 nautical miles per hour; using elaborate calculations and tabulated results, based on the duty performed by H. M. S. *Rattler*, with a given power, and under known conditions. Objections were raised to accepting 7½ knots per hour as the data for the present average rate of speed of ocean steamers: it was urged, that such an average must have been derived from the voyages of steamers of old date, and without regard to the later results deduced from the performances of the Cunard and Collins lines of steamships. The propriety of taking the *Rattler* as a model steamer was questioned, especially as the data were not given for selecting that vessel, it being argued that the *Rattler* had not performed a series of long voyages, under every variable line of immersion, or under such changes of weather and states of the sea, as to furnish data for such important deductions.

The advantage of increasing the proportion of length to breadth was apparent, if it was admitted that the cargo-bearing capacity of a vessel was thus augmented without materially affecting her direct resistance through the water, supposing her midship section to remain unaltered. The proper proportion of length to breadth for an efficient ocean steamer was, however, an intricate question. Taking the *Wave Queen* as an example, the length of that vessel had been stated to be thirteen times her beam; now such proportions might answer well for the river Thames, and a great speed might be attained; but such a vessel would, under certain circumstances, be unfit to navigate the British Channel. The same might be said of the American river steamers, which were reported to have attained almost fabulous rates of velocity; but such proportions as theirs, if attempted in ocean steamers, would only induce failure and loss of the vessels in heavy gales in the open ocean.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, December 15, 1853.

John Agnew, Esq., President, P. T., in the chair.

John F. Frazer, Treasurer.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

A letter was read from the Royal Society, London.

Donations to the Library were received from Hon. J. R. Chandler, U. S. Congress; Lieut. J. A. Dahlgren, U. S. Navy; W. H. Shock, Esq., Chief Engineer, U. S. Navy; Richard Rush, Esq., Washington, D. C.; Dr. Cohen, and The Baltimore and Ohio Railroad Company, Baltimore, Md., and Ellwood Morris, Esq., Civil Engineer, Hillsborough, Ohio.

Donations to the Cabinets, from Washington Jones, Esq., Philadelphia.

The Periodicals received in exchange for the Journal of the Institute were laid on the table.

The Treasurer read his statement for November.

The Board of Managers and Standing Committees reported their minutes.

The Committee on Exhibitions presented their report on the late Exhibitions of American manufactures.

Resignations of membership in the Institute (3) were read and accepted.

New candidates for membership in the Institute (10), and those proposed for membership at last meeting (134), were duly elected.

Nominations were made for Officers, Managers, and Auditors of the Institute for the ensuing year.

On motion, it was

Resolved, That the polls for receiving the votes of the Members of the Institute, for Officers, Managers, and Auditors, for the ensuing year, at the annual election, to be held on Thursday, January 19th, 1854, shall be opened at 3 o'clock, and closed at 8 o'clock, P. M.; and that seven members be appointed by the President, P. T., to receive the votes, and report the result thereof.

Mr. Fairman Rogers exhibited a model of a contrivance for preventing the annoyance of dust on railroads; invented by a gentleman of Delaware.

It consists of a platform, or guard, of any light material, which is fastened under the car, parallel to its floor, a few inches above the level of the rails, suitably shaped openings being made in it to allow the wheels to work through, and flaps attached to close completely the joints between the cars. A curtain of leather or canvas reaches from the end of this platform to the ground.

It is proposed to apply it to the engine and tender, as well as to the cars; the pilot or cow-catcher of the engine being sufficiently low to clear away any obstruction on the track which might injure the platform.

The inventor claims for this arrangement, in preference to that now in

use upon the Camden and Amboy and other roads, which is merely a curtain hung from the side of the car, that it will prevent the dust getting into the trucks and grinding them out; also, increased safety to any one falling through between the cars, the platform preventing a descent upon the rails.

Mr. Rogers also described a new chilled cast iron wheel tire, used by the Baltimore and Ohio Railroad, for the driving wheels of their locomotives. In the traffic of that road, with heavy grades and large loads, the necessary use of sand on the rails has been found to wear the ordinary Low Moor wrought tire into flat places upon the circumference of the wheel. In addition, the wrought tires being shrunk on hot, are exceedingly difficult to remove and replace when worn. The new tires are cast in contact with a cold iron ring, in order to chill the tread and flanch; and the outside of the wheel and the inside of the tire being carefully turned to fit each other, and slightly coned towards the outside of the wheel, the tire is dropped into its place, set by a few blows with a sledge, and brought to its bearing by bolts passing through lugs cast on the tire. By having tires ready turned to fit the engines, a set of wheels can be newly tired in a very short time. The cast also costs much less than the wrought tire, and resists the wearing action of the sand on the rails a much longer time.

Mr. Rogers also laid before the meeting, drawings of the locomotive engine constructed by J. A. Maffei, of Hirschaw, to surmount the heavy grades and stiff curves of the approaches to the Sœmmering Tunnel, Vienna and Trieste Railroad, Austria.

G. W. Smith, Esq., exhibited a drawing of the *Great Republic*, the largest clipper ship ever built, the tonnage being over 4500 register; the length, 325; beam, 53 feet; depth of hold, 39 feet; the aggregate length of mainmast, topmast, top gallant mast, and royal mast, being 276 feet; was built in Boston, during the present year; a movable steam engine on her decks is provided, partly to assist in working the ship, and capable of being transferred to a tug, for the purpose of towing her in calms. (We regret to learn, whilst this page is passing through the press, that this, the largest ship of modern times, has this day been consumed by fire.)

G. W. S. referred to the great destruction of bottles during the first process of fermentation of Champagne and other effervescing wines and liquors, and suggested that this might be remedied by enclosing them in great numbers packed together in closed metallic vessels, into which several atmospheres might be injected, and thereby produce any requisite pressure on the exterior of the bottles, and thereby offer an effectual resistance to the counter pressure within them. An arrangement of machinery could be easily adapted to remove the corks when necessary, for decanting the liquid, and at the same time maintaining the pressure unabated within the larger vessel. He believed that this plan which he had devised was worthy of a trial.

G. W. S. spoke of the various tests to which stone had been submitted for the purpose of ascertaining its relative liability to destruction or disintegration from the action of heat and cold, by freezing and thawing. The usual mode of late years has been to suspend a specimen of the stone to be experimented on, over a saucer containing a saline so-

lution, sulphate of soda being commonly employed, the stone being immersed in this solution, and then suspended over it until crystallization takes place. This process is again and again frequently repeated. The number and weight of the small fragments detached and collected in the saucer below, are supposed to indicate the relative durability of the stone if exposed to the action of freezing and thawing. Mr. S. maintained that this method was by no means strictly analogous, and that it would be far better to immerse the stone in pure water, and after removing it, to enclose it in a small metallic box in a freezing mixture, then thawing it, and repeating the experiment as many times as may be desirable.

Mr. S. also made some remarks on the stains which disfigure the surfaces of sandstone and marble in our buildings, &c.—their causes and means of preventing them when practicable. Some of these stains he referred to the development of vegetation from spores inclosed in the interstices of the sandstone for countless ages.

Dr. Rand exhibited C. D. Yale's heater for houses. It consists of an ordinary cylinder stove, surrounded at a suitable distance by a drum. The space between the stove and the drum is loosely packed with thin scrap iron coils. The object of the coils is to intercept the heat radiated from the stove, and communicate it to the air by conduction; also by contact with the stove to draw away its heat, thus giving a large extent of moderately heated surface. It is also believed that advantage will result in the more equable mixture of warm and cold currents by these coils, and that the rapidity of ascent of the column of warmed air will be moderated thereby. There are some ingenious arrangements connected with the model for regulating the supply of warmer air to various rooms.

COMMITTEE ON SCIENCE AND THE ARTS.

Report on James J. Clark's Self-Winding Telegraph Register.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination, a "Self-Winding Telegraph Register," invented by Mr. James J. Clark, of Philadelphia, Pennsylvania—REPORT:

That the nature of Mr. Clark's invention is fully set forth in the annexed description by the Inventor:

The Committee is satisfied from an examination of this instrument, that it will and does perform all that is claimed for it by the inventor, to wit:—maintain the spring within the drum at any tension at which it may have been adjusted, thus producing a constant and perfectly uniform motion of the drum, and consequently of the paper coiled upon it.

The apparatus is adjustable in all its parts, and the tension of the spring may be altered in a few seconds by the operator, without stopping the motion of the instrument, should such alteration be desired.

The importance of an entire uniformity of motion in the paper designed to receive and record telegraphic signals, particularly when the alphabet consists of a series of dots and lines, the latter depending for their length and consequent value upon the length of time during which the point of the style is kept in contact with the moving paper, is too obvious to require further notice.

The saving of time in the use of this instrument is considerable. In the ordinary telegraphic register, the operator is compelled to stop the communication every few minutes, in order to wind up the weight which acts as a moving power to the apparatus.

In that of Mr. Clark the instrument winds itself; the very revolution of the drum winding up, by means of the interposed battery, &c., the spring which causes the revolution.

In regard to the trouble and expense involved in the employment of the additional battery of three cups, demanded by the apparatus, the Committee is satisfied they are so trifling as not materially to detract from its usefulness, and are more than counterbalanced by the advantages before named.

In conclusion, the Committee regards Mr. Clark's invention as new, and, from the considerations above named, a valuable addition to the ordinary register for telegraphs. For the instrument deposited in the last annual Exhibition, and referred by the Committee on Exhibitions to this Committee for examination, it is recommended that the Committee on Exhibitions award a first premium to Mr. Clark.

By order of the Committee,

WM. HAMILTON, *Actuary.*

Philadelphia, April 14th, 1853.

Description by the Inventor.

My self-winding apparatus consists in attaching to an ordinary Morse telegraph register, a second electro-magnet, an armature attached to one extremity of a lever, and a click at the other; this click works into a ratchet wheel. To the lower extremity of the lever, and around the adjusting screw, a reacting spiral spring is placed. On the shaft of the ratchet wheel another ratchet wheel of larger diameter is placed, with two fixed clicks catching into the teeth of the wheel.

On the same shaft with these ratchet wheels is a small cog wheel working into another larger cog wheel, to the shaft of which last wheel the spring is attached. The other end of the spring is fixed to the box, as in a watch. The large wheel is fastened to the spring box, and revolves with it. This cog wheel gears into a small cog wheel placed on the first shaft, which communicates motion to the train of register wheels. On the same shaft with the small cog wheel is also placed a break circuit wheel, consisting of a metallic wheel with broad-faced teeth, against which a metallic spring rests, so that as this break circuit wheel revolves, the spring will fall into the cavities between the teeth, and alternately press against them.

The break circuit wheel, the coils of the magnet, and the wires from the battery are attached together as follows: a wire leaves the battery and proceeds to the coils of the magnet, thence to the spring, thence through the teeth of the break circuit wheel, thence through the metallic frame of the instrument back to the other extremity of the battery.

The operation of the several parts is as follows: When the spring unwinds and propels the train of register wheels it also rotates the break circuit wheel, and as it revolves, the spring alternately strikes the face of the teeth, and then falls into the cavities between them. Each time the

spring presses on the teeth, it, by so doing, closes a galvanic circuit extending from the battery around the winding magnet. When the spring falls between the teeth, this circuit is broken. The winding magnet is thus caused alternately to attract and release the armature; and the lever attached thereto moves the first ratchet wheel through the space of one tooth, and the ratchet on the same shaft half a tooth, so that one of the stationary clicks drops into one of the teeth; the ratchet wheel having double the number of teeth of the ratchet.

The number of teeth on the break circuit wheel is so proportioned, that the lever is caused to vibrate with sufficient rapidity to revolve the first ratchet wheel with the same velocity, proportioned to its gearing, with the spring shaft, that the spring unwinds in revolving the train of register wheels.

By the arrangement thus described, it will be seen that the unwinding of the spring is itself made to start and regulate the action of the winding magnet. When the clock work of the register is stopped, the break circuit wheel ceases to revolve, and the winding magnet ceases to vibrate the armature and lever.

BIBLIOGRAPHICAL NOTICES.

The Electro-Magnetic Telegraph, &c., &c. By LAURENCE TURNBULL, M. D. Philadelphia: A. Hart, 1853. 8vo., pp. 264, cuts and plates.

The greater part of this book was originally the matter of a course of lectures delivered before the class of the Franklin Institute, which were afterwards printed in the Journal, and then published in the present enlarged form. The value of a book of this kind consists necessarily in the care and industry used in collating the various descriptions, and the scientific judgment exhibited in the opinions expressed as to their relative merits. There is, we believe, no work in the English language which has any just claim to be compared with the present one, either in its scope or in the care and impartiality shown in its preparation. Two or more works in the German are entitled to great credit for excellence, but they are all defective from want of knowledge of the very great number of important practical inventions, both in this country and in England. The large work of the Abbè Moigno, published by a remarkably able and industrious man, is scarcely entitled to any other name than that of a general panegyric on Mr. Wheatstone and his inventions. His injustice to the American inventors, and especially to Mr. Morse, whose telegraph has after all been found by use heretofore, to be the practical one, is strongly marked, and renders his work nearly useless here. In the work of Dr. Turnbull, he has preferred describing the various inventions as much as possible in the words of the inventors, and to abstain from the expression of opinion on their relative merits. The statistics of the telegraph in this country will be found very interesting and valuable, and the author has now added an appendix, containing sundry decisions of our courts, which will be important to telegraphic operators and inventors.

As a whole, notwithstanding defects of style, and a certain dryness, which is unavoidable in a collection of mere descriptions without scienti-